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The Massachusetts Medical Society

The next Annual Meeting of the Massachusetts Medical Society will be held in Boston, at the Hotel Statler, June 3, 4, and 5, 1935.

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NUTS AS BRONCHIAL FOREIGN BODIES

BY LYMAN G. RICHARDS, M.D.,* AND JOHN WALKER, M.D.*

INTRODUCTION

IT is estimated that the people of the United States consume annually, as part of their diet, some 1,243,695,000 pounds of nuts, of which over 1,000,000,000 pounds are peanuts. Of late years, there has been an ever-increasing popularity of confections in which are incorporated various forms of these nuts and which are offered for sale, particularly for the delectation of children, in colorful and varied forms, with a nomenclature which becomes almost daily more extensive. Inquiries into the stock of a group of stores reveal the fact that there are at least twelve forms of these nut-containing candies in addition to the various forms of peanuts and other nuts sold in the natural state.

Date: February 9, 1930. Name: D. L. Age: 5 5/12 years.

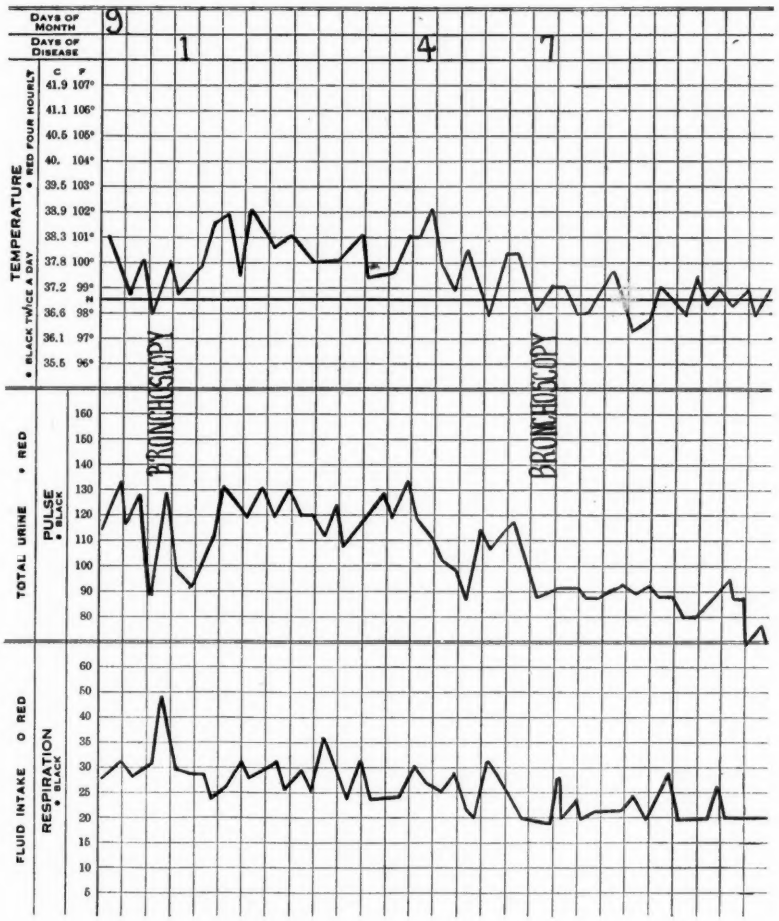

FIG. 1. Incomplete removal of foreign body with febrile reaction until second bronchoscopy.

A survey of the foreign bodies which have been removed from the larynx, trachea and bronchi of children admitted to the Children's Hospital of Boston during the last ten years, reveals that in twenty-six instances, or thirty-six per cent, the foreign body was some form of nut, inadvertently inhaled while being eaten. Statistics gathered from a group of the country's leading bronchoscopists show the percentage of nuts oc-

*Richards, Lyman G.—Surgeon in Otolaryngology, Children's Hospital. Walker, John—Formerly: Resident in Surgery, Children's Hospital, Boston. For records and addresses of authors see "This Week's Issue," page 696.

curring as bronchial foreign bodies to average thirty-two per cent of the total. In view of this relatively great frequency with which a common article of food may become a source of great potential risk to any child, we feel justified in recording some analysis of our own series. While the total is obviously small in comparison with those seen at some of the larger bronchoscopic clinics, the data have been studied with a view to the detailed consideration of factors which are often omitted in reports of foreign body cases and which are yet of great importance to the general practitioner and pediatrician who is so likely to be the first to see these cases.

Date: February 28, 1932. Name: D. C. Age: 4 11/12 years.

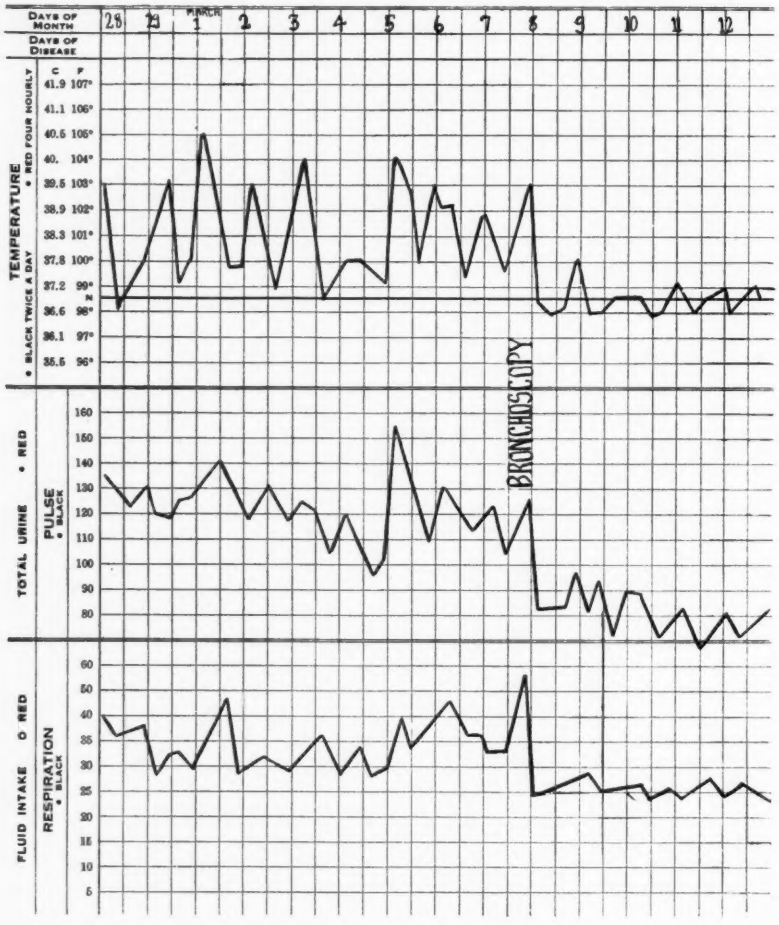

FIG. 2. Severe preoperative reaction preceding foreign body removal.

AGES

A survey of the ages of our patients throws some light on the incidence of nuts as bronchial foreign bodies. Our youngest patient was twelve months old, our oldest four years, and the average age 3-3/12 years. Statistics of bronchial foreign bodies of all classes show a considerable number of patients under one year. Between the ages of six and twelve months, infants, making their first acquaintance with their fascinating environments, tend frequently to put small objects of every description into their mouths, and by mischance, occasionally to aspirate them into the respiratory tract. But nuts during this age group are quite rare, primarily because only through the agency of some older person, a parent, or elder brother or sister, can the infant secure this form of foreign body. Only when the more advanced age period from one to three years is reached, when a more varied diet is in order, do misguided elders allow the baby a nibble of such unfamiliar dietary divergences as a nut-containing chocolate bar or a few salted peanuts. Induced ofttimes by a crying or laughing spell, a sudden inspiration draws in a fragment of nut and the damage is done. Older children will, of course, aspirate a nut, in pure form or incorporated in candy on their own responsibility, and paradoxically at times, a well-meant parental effort to stop them in the very act of eating has provoked a coughing or crying spasm, resulting in aspiration, whereas the child, left to its normal mastication, might well have had no difficulty. In any case, parents should realize the importance of excluding nuts, in all forms, from the diet of children under three years of age, and preferably in older chil-

dren. Warning should be given in the case of any nut-containing candy as to the thorough mastication of the nut particles contained therein.

HISTORY

The securing of a positive history of aspiration of a vegetal foreign body is of the utmost importance, since in these cases one lacks the valuable assistance afforded by x-ray in opaque foreign bodies. If the period of aspiration, particularly in a child too young to describe the accident accurately, has passed unobserved by any adult, the ensuing signs and symptoms may for a time at least be so mild and insignificant as to be attributed to any one of a dozen less serious conditions. It is therefore the duty of any physician to whom a child is referred for any unexplained cough, a slight but persistent fever, a transient pain in the chest or unusual lassitude or anorexia, to at least inquire into the history of possible aspiration. With this end in view, he will find himself faced with one of the following situations. (1) The parents will have observed the child to have had a definite choking or coughing spell, usually accompanied by some cyanosis, coincident with the eating of peanuts in any of their numerous forms, a candy bar or other nut-containing confection. (2) The accident of inspiration may have occurred unknown to the parents and hence the latter will deny its existence. (3) Parents may have observed some symptoms suggestive of aspiration, but, unappreciative of their import, will not venture to report them until their attention is specifically directed to such a consideration by the physician. A preliminary denial may even at first be secured, to be followed, after more mature consideration of the circumstances and a mental review of the events, by an acknowledgment that aspiration may have taken place or that the opportunity for such, at least, existed.

Least of all must the physician who first sees such a potential foreign body case treat with levity or disregard any voluntary suggestion by parents that accidental aspiration may have occurred. In the series of aspirated nuts here presented, there is not a single case in which, when the history in any way raised a definite suspicion of foreign body, one was not found to be present. Failing the securing of any pos-

Date: April 25, 1928. Name: M. D. Age: 5 years.

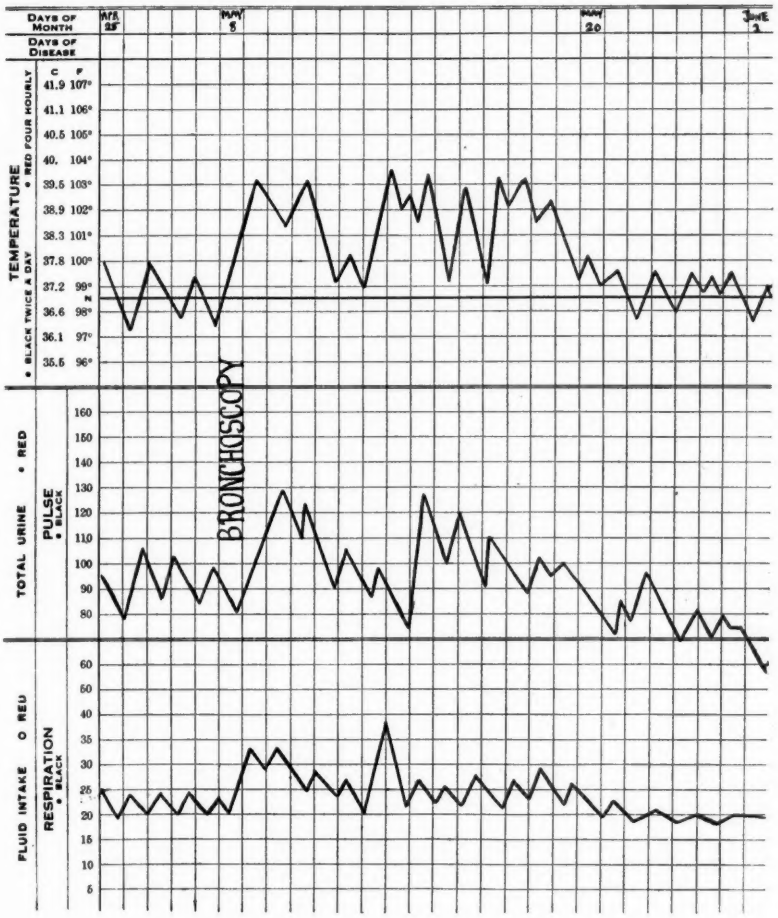

FIG. 3. Stormy convalescence following removal of peanut.

itive history, in the presence of signs and symptoms at all suspicious, a diagnostic bronchoscopy should be performed. A negative examination, with all that it entails, is preferable to the failure to diagnose such a case and to allow complications to ensue under the guise of chronic bronchitis or unresolved pneumonia. The history in the present group of nut cases may be briefly summarized as follows:

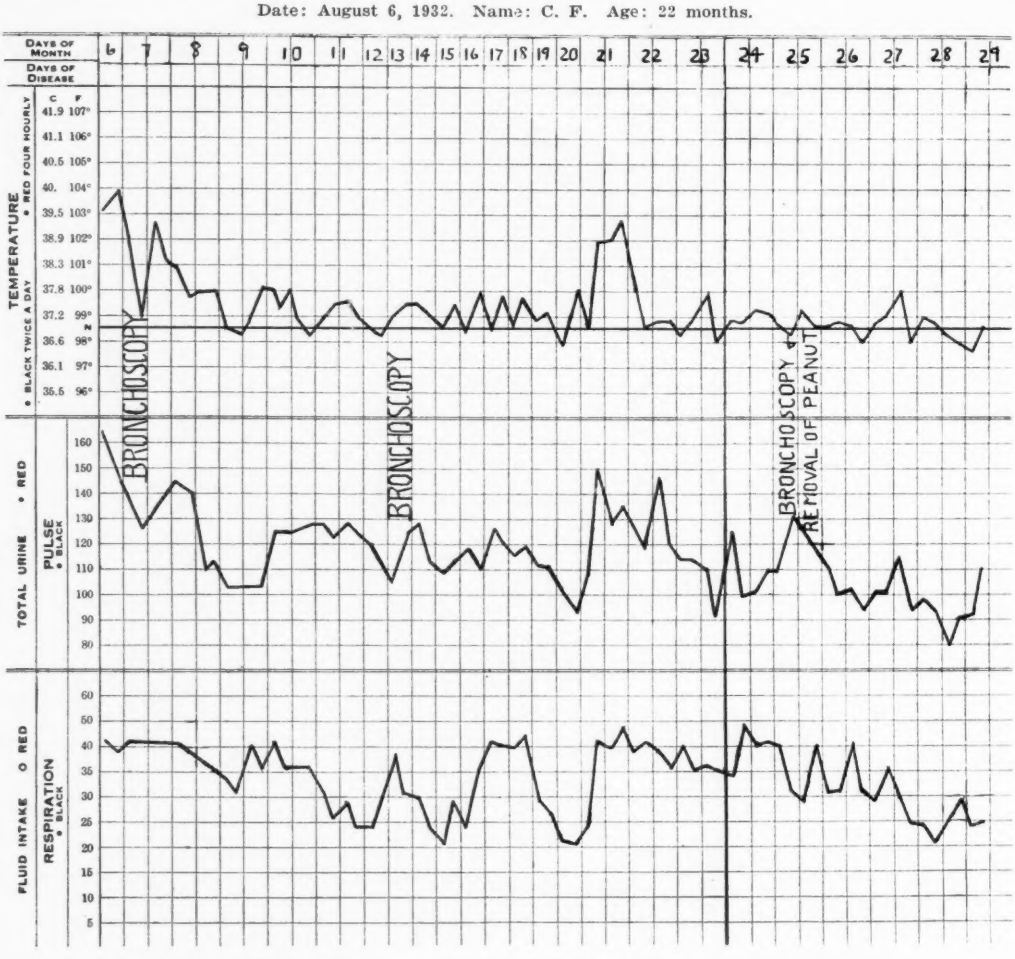

FIG. 4. Two unsuccessful bronchoscopies before final removal of foreign body.

A. Negative

Initial symptoms unobserved by adults or not revealed by the child—2.

B. Positive (Actual observation or aspiration suspected from circumstances)—24.

1. Reported to physician or hospital voluntarily—19.
2. Reported to physician or hospital on questioning—5.

It thus appears that in by far the greater number of cases parents are aware that some accident has taken place which should merit the immediate attention of a physician. That the parent so frequently does not appreciate the gravity of the situation as manifested by the elapsed time before many of the patients came to bronchoscopy, is due primarily to the fact that once the offending nut fragment has passed the glottis, traversed the trachea and come to lodge in either the right or the left main bronchus, the severity of the initial symptoms subsides and the conclusion is instantly reached that the object has entered the stomach and no harm has been done. This leads to a delay in the summoning of a physician. In our present group, we find in this respect that no physician was called in connection with the immediate aspiration in five instances. In the remaining cases in the series, a physician was called within an average time of three days and immediately in six instances. The possible mildness of post-aspiratory symptoms is exemplified in one case in which no physician was consulted until eighteen days after known aspiration.

This average time of three days before reference to a physician in sixteen cases becomes of significance when it is compared with the average time interval which lapsed before these patients entered the hospital. For all cases, including those who did not consult a physician,

this was an average of twelve days. For the group who did, within an average of three days, seek medical advice, this time interval was an average of eleven days. While in numerous instances patients were referred for bronchoscopic treatment within twelve hours of the time of aspiration, this discrepancy between three days and twelve days indicates the need of stressing the importance of early reference of these cases to a bronchoscopic clinic, at least in those instances in which a positive history of aspiration is given or obtained. In fifteen cases in this latter group we again find the time average before reference to a physician to be approximately three days, with a hospital reference time of an average of seven days. This figure of seven clearly indicates the benefits occurring from a knowledge of the history of aspiration as compared with the eleven-day average which includes the cases in which no positive history was offered by the parents. The major responsibility rests, therefore, with the parents, first to call a physician in event of anything suggesting aspiration of the foreign body. If this is done, and if the physician then accepts the story at its face value, there will be no appreciable number of cases of delayed removal. Once the question of aspiration has been raised, however, the physician must not let the relative absence of physical signs or mildness of symptoms deter him from seeking bronchoscopic confirmation of the diagnosis or aid in removal. Delay after this point often means increasing difficulty in removal or a likelihood of subsequent complications. In cases of unexplained pulmonary signs, even in the face of a negative foreign body history, bronchoscopy should be resorted to as the final diagnostic measure.

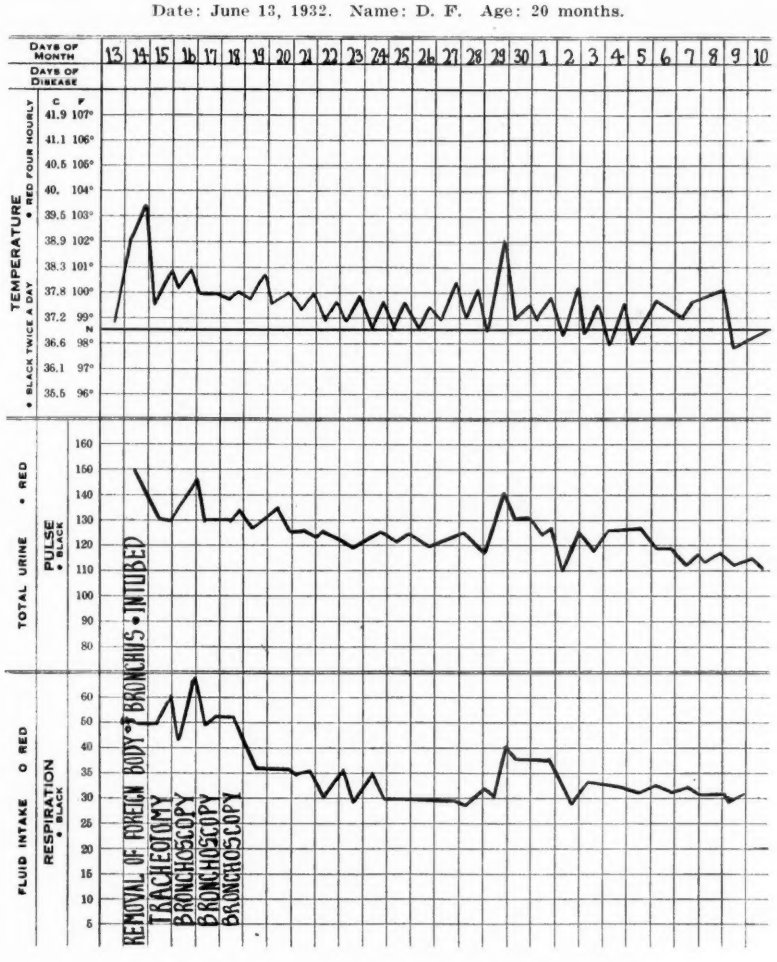

FIG. 5. Severe postoperative reaction with complications.

It should be noted that in several of our series of cases, possible aspiration of a nut was at first denied, only to be acknowledged on more searching and repeated questioning. A story of aspiration, which would never be given voluntarily, can frequently be obtained if vigorously sought and will rarely prove to be a false scent. A coughing spell, symptomatic so often of other conditions, does not always suggest foreign body to the parents until their attention is specifically directed to the possibility of a half-eaten candy bar, a jar of nuts on the table nearby, or a fall

or laugh or cry with something in the mouth. In one of our cases (No. 14) the patient was at the time suffering from whooping cough and the paroxysm attending inspiration of a peanut might, but for skilful questioning by the physician, easily have passed for a spasm of this common complaint.

ADMISSION SYMPTOMS

We come now to the appearance presented by these known or subsequently proved cases of nuts in the bronchus on their admission to the hospital. By far the greater number showed no evidence of any acute illness, only one case (No. 6), being thus classified. Fever was not a conspicuous sign, the average rectal temperature being 100°, the highest 104°, with only five showing a fever of 103°. In these instances of higher temperature, the average duration of presence of the foreign body was ten days, but there were numerous instances where the nut had been known to have been in the bronchus for a considerably longer time in which there was little or no febrile reaction. This brings up the important question of so-called arachidic bronchitis, a condition characterized by a violent febrile reaction and considered to be due to a peculiar response to certain toxic substances (contained in nuts and certain other vegetal foreign bodies). This feature of these particular foreign bodies has been reported by numerous authors and has lately been made the subject of an experimental study by Heatly[1] who showed quite conclusively the irritative effect of certain extracted peanut oils on the lower respiratory tract of animals, which simulated quite closely the symptoms in infants and children who had aspirated nuts, corn kernels, peas, etc. We have been quite surprised and somewhat puzzled in reviewing these cases of aspirated nuts to find an almost complete lack of this so-called arachidic bronchitis throughout the entire series. Even those cases manifesting a febrile reaction did not fit the clinical picture of the condition as commonly described by other authors. In only one instance (Case No. 16) did suggestive symptoms appear, but this was after and not before the extraction of the foreign body, in this instance a piece of almond kernel. Incidentally, the almond has the reputation for producing a more than ordinarily virulent form of arachidic bronchitis. In our own experience, this same clinical picture has occurred much more frequently as the result of severe streptococcic infections of the upper respiratory tract than of a foreign body and it is an open question if this infectious element may not be present in certain of the vegetal foreign body cases reported as being the result of some inherent toxic substance in the foreign body itself.

The average pulse rate on admission in the present series of cases was 123, certainly not indicative of any serious toxicity or reaction. In only one instance was a rate of 160 recorded.

Bearing more immediately on the question of bronchial obstruction and its clinical manifestations was the respiratory rate. One thinks naturally of a pronounced rise in this rate as a foregone conclusion in any case in which there is evidence of complete or partial obstruction of the entrance of air into one side of the lung. Nevertheless, the average respiratory admission rate in these twenty-six patients was only 33, the highest being 50, and yet, as will be shown later, practically all these cases showed bronchial obstruction and were carrying out the oxygenation of their blood with a pulmonary area diminished by from one half to one fourth of the normal. The involvement of a similar area in a pneumonia would entail a respiratory rate of from 50 to 70, so that it is quite clear that the obstruction per se is not a particularly potent cause of dyspnea. A similar situation is of course observable in patients with an artificial pneumothorax. The rate of 33 is somewhat above an average normal and fourteen of these cases were classified as slightly dyspneic on exertion, three markedly so and nine as showing no respiratory embarrassment whatever. This factor is stressed, since it is often this lack of signs of urgent dyspnea which leads a physician astray and hence to conclude that, in the absence of more obvious signs of obstruction, the foreign body has been swallowed and not aspirated. Cyanosis, the final stage in respiratory obstruction, was entirely absent in eighteen of these cases, suggestive only in eight and marked in only one. Its presence should never be awaited before concluding that bronchial obstruction exists.

Perhaps the one most constant and suggestive sign exhibited by this group of patients was a cough. Even when physical signs were only mildly suggestive and when all other evidences of foreign body failed, a persistent irritative cough was likely to be present. This was so in twenty of these cases. In about half of these the cough was harsh and brassy, in the remainder it was loose and moist. It was more apt to be of the latter type in patients in whom the nut had been present for a considerable period of time and in whom there was beginning to appear a purulent reaction with accumulated bronchial secretions.

Hoarseness was present in only two cases and in none was the nut found engaged in the larynx itself. Once having passed this barrier, there seemed almost no tendency for the foreign body to leave its point of lodgment in either the bronchus or the trachea, hence the absence of any tendency to laryngeal irritation.

PHYSICAL EXAMINATION

Second only to the obtaining of a positive or suspicious history of aspiration are the signs

to be elicited by physical examination in cases of nuts or nut fragments in the upper air passages. Within certain limitations, these signs fall into distinct categories and when present go far to establish a positiveness of diagnosis almost equal to x-ray evidence of an opaque foreign body. For this reason, a most careful examination of the lungs is of the greatest importance, together with an accurate interpretation of the findings, since otherwise definite signs may be most misleading and indicate a foreign body on the right side when it is actually on the left.

The three commonest signs, so often associated together as almost to constitute a triad, are (1) unilateral limitation of expansion of the lung and chest on the affected side; (2) hyperresonance to percussion (so-called obstructive emphysema); and (3) absent or greatly diminished breath sounds. In the present series of twenty-six cases, the first of these signs was present twenty-one times, the second twenty, and the third twenty-three. All three of them depend primarily on a single physical fact, i.e., a partial obstruction to the ingress of air into the affected lung or part of the lung. Under these conditions, air will enter the lung past the foreign body at the time of inspiration, when the bronchial diameter is somewhat increased. On expiration, however, the bronchial wall contracts and the nut, or its fragment, acting in the nature of a valve, prevents the egress of air. As a result, the lung gradually becomes more and more inflated and emphysematous, producing the so-called obstructive emphysema to which attention of late has frequently been called by numerous authors. A lung or lobe thereof gradually inflated in this manner, would produce all three elements of the above-mentioned triad. There will be a limitation of expansion, since such a lung will no longer take part in the normal cycle of inspiration and expiration. Breath sounds will be diminished or absent since after a certain degree of inflation, no appreciable amount of air can enter the distended lung. Hyperresonance to percussion will be an obvious sequel to such a situation.

The extent to which such signs are present

PHYSICAL EXAMINATION

Case	Consolidations (Atelectasis or Pneumonia)	Bronchial Breathing	Dullness or Flatness to Percussion	Unilateral Limitation of Expansion	Hyperresonance or Emphysema	Absent or Markedly Diminished Breath Sounds	Râles
1.	0			+ (L)	+	+	0
2.	0			+ (L)	+	+	0
3.	0			+ (L)	+	+	0
4.	+		+	+ (R)	0	+	0
5.	0	+	+ (R)	+ (R)	0	0	+
6.	+ (R)	+ (L&R)	+ (R)	+ (R)	+ (L)	+ (R)	0
7.	0	0	0	0	+ (R)	+ (R)	+
8.	0			+ (L)	+	+ (L)	0
9.	+	+	+	+ (R)	0	0	0
10.	0	0	0	+ (R)	+	+	0
11.	+ (LL)		+ (LL)	+ (L)	+ (LU)	+	0
12.	+ (LU)		+ (LU)	+ (L)	+ (R)	+ (L)	0
13.	0	0	0	0	+ (L&R)	+ (L&R)	+
14.	0		+ (R)	+ (R)	0	+ (R)	0
15.	+ (RL)	0		+ (R)	0	+ (R)	0
16.	0	0	0	+ (L)	+ (L)	+ (L)	0
17.	0	0	0	+ (L)	+ (L)	+ (L)	0
18.	0	0	0	0	0	0	0
19.	0	0	0	+ (L)	+ (L&R)	+ (L)	0
20.	0	0	+ (LL)	+ (L)	+ (LU)	+ (L)	0
21.	0	0	?	+ (L)	+ (L)	+ (L)	0
22.	0	0	0	+ (L)	+ (L)	+ (L)	0
23.	0	0	+ (RL)	+ (R)	+ (L, RU)	+ (R)	0
24.	0	0	0	0	+ (L)	+ (L)	0
25.	0	0	0	+ (R)	+ (R)	+ (R)	0
26.	0	0	0	0	+ (R&L)	+ (R&L)	+

R = right; L = left; LL = left lower; RU = right upper; RL = right lower; LU = left upper.

SUMMARY OF PHYSICAL SIGNS

Unilateral expansion	in 21 out of 26 cases.
Hyperresonance (emphysema)	in 20 out of 26 cases.
Absent or diminished breath sounds	in 23 out of 26 cases.
Râles	in 4 out of 26 cases.
Consolidation or atelectasis	in 6 out of 26 cases.
Bronchial breathing	in 3 out of 26 cases.
Dullness or flatness to percussion	in 9 out of 26 cases.

is determined for the most part by the size and location of the nut causing the obstruction. If the lumen of the right main bronchus, for instance, is occluded by a large portion of nut just below the bifurcation of the trachea, then the entire right lung will exhibit the above-mentioned signs. If, however, a smaller piece is partially occluding the orifice to the right lower lobe alone, then the area over which these signs are detected will be correspondingly smaller.

The signs just described are those that supervened almost immediately after inhalation of the foreign body. As time goes on, and obstruction becomes more and more complete, due to swelling of the bronchial mucosa around the nut, the ball valve action ceases and air can neither enter nor leave the lung. Gradually this air is absorbed and there then ensues a different picture with the clinical signs of atelectasis. That this is a development requiring more than average time is borne out by the fact that in only six of our patients was it detected, in spite of the fact that several weeks had passed in some of the others who still showed signs of obstructive emphysema. Atelectasis would still manifest the signs of limited expansion and diminished breath sounds, but would differ in the absence of hyperresonance. The sign of dullness or flatness to percussion, recorded in nine of our twenty-six cases, would of course fit consistently with atelectasis. It appears likewise in certain instances in which there has taken place some exudation of fluid into the lung tissues, following the absorption of the air, constituting what Jackson has termed a "drowned lung". Abscess formation would be the natural outcome of this situation unless the foreign body were removed.

Bronchial breathing appeared only three times and was not due, as other authors have pointed out, to a true pneumonic consolidation. This latter is extremely rare in connection with vegetal foreign bodies and the signs suggestive of it are far more frequently due to some compression of a lobe adjacent to an area involved in obstructive emphysema.

It is interesting to note that râles were recorded in these cases on only nine occasions. They were indicative of some suppuration, or more frequently, of a nut fragment in the trachea. Here there is no tendency to obstruction of a bronchus, the fragment being so large as to fail to engage the bronchial orifice. It lies, therefore, loosely in the trachea, often moving back and forth, with coughing, at times audibly striking against the lower surface of the vocal cords, and producing an irritative tracheitis. This is accompanied by an excretion of tracheal secretion and the consequent finding of râles. In this situation, both sides of the chest would give essentially negative signs of hyperresonance or diminished breath sounds or limited expansion.

Various combinations of these typical signs may be encountered. There may occur a partial atelectasis in a lower lobe and an obstructive emphysema in a middle lobe, depending entirely on the extensiveness of the obstruction and the location of the foreign body. Particularly must one be on one's guard against misinterpretation of a true compensatory emphysema. This occurs in a normal, unobstructed lung, with some hyperresonance, but with exaggerated, not diminished, breath sounds. It is the result of nature's effort to compensate for the disability of the obstructed lung, which though likewise emphysematous, shows diminished expansion and suppressed breathing.

X-RAY FINDINGS

While the roentgen-ray examination of cases of non-opaque foreign bodies in the lung must necessarily be far less conclusive than in the case of metallic objects, nevertheless, with certain technical refinements and appreciation of detail developed in the past few years, much valuable information can be obtained. Chief among these advances has been the taking of the films as nearly as possible at the end of inspiration and at the end of expiration. This is not always easy or even possible in an uncooperative or crying child but it affords an opportunity to bring out by x-ray one of the most important diagnostic features exhibited by such bronchial foreign bodies as nuts, that is, obstructive emphysema, to which reference has already been made above, in considering the physical signs. Films of a normal chest taken at the end of inspiration will show equally transparent and slightly hyperaërated lung fields. At the end of expiration, these fields will again be of equal density but definitely less aërated, due of course to the expulsion of all but the residual air from the lungs. If now a piece of nut, acting as a ball-valve, gradually traps air in the obstructed lung, with a resultant obstructive emphysema, the roentgen-ray picture will be quite characteristic and of distinct diagnostic help. On full inspiration, with air entering both sides of the chest, there will be the normal appearance of bilateral hyperaëration. At the end of expiration, however, a distinct variation is noted. The normal, deflated lung will show a slightly diminished density, as compared with the abnormal or obstructed side, which by reason of the imprisoned air, will show the same hyperaëration as is seen in both lungs at the end of inspiration. The situation, if not clearly understood, may lead to a totally erroneous opinion as to the location of the foreign body as one would be inclined to regard the more complete-

ly aërated lung (at the end of expiration) as the normal one, whereas in reality it is the obstructed one.

If now such changes have occurred in the lung as the result of a more prolonged sojourn of the nut in the bronchus and emphysema has been replaced by atelectasis, then a different picture obtains. At the end of inspiration, only the normal lung is aërated, while at the end of expiration both sides show a diminished radiability, more marked on the affected side. Practically never is any shadow cast by a nut itself visible.

Naturally these findings by x-ray are not always clear cut, and other factors enter into the picture, which must be correlated with the results of the physical examination. The history and physical findings alone would, regardless of the x-ray report, warrant bronchoscopic examination in any case, but confirmatory evidence is always helpful.

Additional information is to be obtained from fluoroscopic examination of the chest. Here a typical obstructive emphysema will show a limitation of motion of the diaphragm on the affected side and a displacement of the heart and mediastinum to the opposite side. Similar limitation of motion without displacement or with displacement to the affected side would be seen in the case of atelectasis.

In those instances where the foreign body is too large to engage in the bronchial orifice it must remain loose in the trachea. In these cases there will, of course, be no x-ray signs of unilateral obstruction and the roentgenologist cannot of course be expected to confirm any diagnosis of foreign body.

In the present series under review, there is recorded a positive roentgenological finding of foreign body in twelve cases and a negative one in five. In the latter instance, this does not of course mean that the roentgenologist declared no foreign body to be present but merely that so far as his findings were concerned, they did not tally with the classical signs of bronchial obstruction. Regardless of this report, other findings in the history and physical examination fully justified bronchoscopy even had no foreign body been found. Such negative x-ray report might be due to the presence of the nut in the trachea or to an examination made before any of the classical signs of obstruction had had time to develop.

Obstructive emphysema was clearly noted in eleven cases and displacement of the heart and mediastinum to the opposite side in the same member. There was unilateral limitation of motion of the diaphragm recorded in nine instances. Peribronchial infiltration was reported five times and atelectasis of the affected side seven times, indicative of course of a more prolonged sojourn of the foreign body.

In general the x-ray examination is useful as a part of confirmatory evidence when positive. It is very valuable when it contributes the first suggestion of bronchial obstruction in a case in which, through failure to suspect a foreign body or inquire into the history as to its possibility, this diagnosis had not been previously taken into consideration. Negative x-ray reports, however, have far less bearing on any suspected case of bronchial foreign body.

ANESTHESIA

The question as to what form of anesthesia is best adapted to the operation for removal of bronchial foreign bodies is one which has occasioned considerable discussion among different bronchoscopic schools. Certain operators, feeling somewhat handicapped through infrequent occurrence of these cases and lack of a trained and ever available team of assistants, prefer the use of a general anesthetic, such as ether, as affording greater relaxation and ease of manipulation and hence as contributory to a greater degree of successful removal. Were there no opposing disadvantages or even dangers to the use of ether, there would undoubtedly be much in favor of this more complete anesthesia, both from the standpoint of comfort to the patient and easier working conditions for the operator. Jackson, however, to whom we must invariably refer as having had a far greater experience in this work than any other living person, has long maintained a position against the use of any anesthetic in removal of bronchial foreign bodies in children and particularly in the type of intruder here under consideration. His reasons rest primarily on the danger of eliminating, by general anesthesia, the action of the accessory muscles of respiration, which in any dyspneic patient are most necessary to maintain the chest expansion under such circumstances. Moreover, should respiration, by any chance, cease under general anesthesia, it is far more difficult by any artificial means to achieve its resumption than is the case when no anesthesia is employed. While, in our experience, few of these cases of unilateral bronchial obstruction from aspiration of nuts are in any sense urgently dyspneic, nevertheless, with such possibilities as jamming of the nut in the trachea or larynx or in the uninvolved bronchus, we are heartily in accord with opposition to general anesthesia so far as ether is concerned. Moreover, ether induces an excessive secretion of mucus which is an additional handicap in the operative procedure. In the present series, fifteen of the patients received no anesthetic at all with the exception of a few instances where a small preliminary dose of morphine was administered. On these patients, seventeen bronchoscopies were performed.

It must, however, be acknowledged that, for the average operator, to whom these cases come

with some irregularity and infrequency and who must because of his location nevertheless take care of them when they do, the difficulties of working on a struggling child in the performance of this delicate procedure present no small problem. True, he should have available capable assistants, trained in the restraining of such patients, and he should, obviously, maintain his own skill at the highest possible level by regular practice in the laboratory or on the mannequin. Neither of these forms of practice, however, duplicates the situation encountered in the operating room and if, in spite of his best efforts, the operator finds himself handicapped by the varied factors incident to working without anesthesia, he cannot but wonder and hence wish that there were some form of anesthesia to which he might have recourse, provided always that it adds not the slightest risk to the procedure. In addition, were any such anesthetic to be found, it cannot be denied that the sparing to the patient of an obviously uncomfortable, if not actually painful ordeal, would be an added advantage. Any form of morphine in doses sufficient to produce appreciable analgesia would be quite unsafe because of the respiratory depression and is mentioned only to be condemned. Is anything else worthy of consideration? During the past two years we have employed the rectal anesthetic, avertin, in several bronchoscopic examinations of cases of chronic pulmonary suppuration. We were struck with the manner in which the procedure was facilitated, with the complete analgesia afforded the patient and with the satisfactory manner in which the protective laryngeal and cough reflexes were maintained. The patient's circulatory and respiratory functions were in no way embarrassed or depressed and we felt that the use of such an anesthetic might have some place in foreign body removal for certain operators and under certain conditions. It would, of course, be out of the question on any case showing the slightest signs of dyspnea or circulatory embarrassment and in any instance in which the patient's condition suggested that its use would contribute the least bit of additional risk. In many other instances of bronchial obstruction, such as that occasioned by nuts here under consideration, we feel it may, when used judgmatically, contribute to more successful removal than might otherwise be possible. It must be given by an anesthetist skilled in the administration and with the careful observation of all the details which must be carried out.

In the present series of nuts removed from the respiratory tract, avertin by rectum was used in thirteen bronchoscopies on eleven patients. The dose varied from 80 to 100 milligrams per kilo of body weight. That its use lessens the strain on both operator and patient cannot be denied, though it may still be criticized with some validity. In only one instance was there any complication which could be construed as the direct result of the use of avertin. In another case there was a brief period following removal of a portion of peanut in which a slight acapnia developed which was easily combated with the inhalation of carbon dioxide. A summary of the complications in this series of cases, to be taken up in detail later, shows no preponderance of trouble occurring in cases anesthetized with avertin over those without any anesthesia. The only fatality occurred in a case in which no anesthetic was given.

For the operator who is seeing these cases with reasonable frequency, who has a trained team of assistants always available, and whose technique is quite able to cope with the unavoidable resistance of a conscious patient, the use of any anesthetic is quite unnecessary. For those operators who do not work under these desirable and fortunate conditions, avertin would seem to offer certain advantages if used under properly controlled conditions.

OPERATIVE AND BRONCHOSCOPIC FINDINGS

The operative technique involved in the removal of the foreign bodies here analyzed has many attributes common to any bronchoscopic procedure and hence will be dealt with here only in considering such features as are peculiar to nuts. Among these features are to be mentioned, first, localized reaction to the foreign body, secondly, technical difficulties in removal and, thirdly, immediate postoperative reactions.

1. As mentioned above, many authors have called attention to the unusual reaction occasioned by the presence of nuts and other vegetal substances lodged in the respiratory tract. This has been manifested by intratracheal and bronchial inflammation and a high toxic febrile reaction. Strangely enough, none of our cases manifested this reaction, even when the nuts had remained in situ for periods of time up to five weeks. Whether this fact is in any way related to differences in the nuts, in their state when aspirated, that is, cooked or uncooked, is difficult to say. Of the fact that such reactions have been frequently observed, there can be no doubt. In our own cases, the reactions set up by the invader were recorded as negative in thirteen instances and as consisting in seven cases of such an edema and inflammation of the bronchial wall just proximal to the foreign body as to partially obscure it. Definitely purulent secretions were encountered only four times and pure blood and mucus were each mentioned once. It is interesting to inquire into the relation between these findings and the length of time that the nut had been present in the respiratory tract. With a few exceptions, the marked signs of local inflammation as evidenced by edema of the bronchial wall or by purulent

secretions occurred in those cases in which the foreign body had been present for three weeks or more. This is, of course, what might be expected and is an obvious point in support of the contention that the earlier the diagnosis is made, the easier will be the problem of removal. An annular ring of edema, obscuring a large part or whole of the nut fragments, adds considerably to the difficulty of removal, as does also the presence of purulent secretions which require repeated aspiration before removal may be safely attempted.

2. Technical difficulties. Foreign bodies such as nuts do not, of course, present the problem so often encountered in dealing with pointed objects such as nails and tacks, and removal per se is not likely to do any damage to the bronchial wall. What may best be termed "fragmentation" is perhaps the greatest obstacle encountered in the removal of nuts. There is a tendency for such objects to break by cracking when grasped with forceps, and the longer their presence in the bronchus and their contact with bronchial secretions, the greater this tendency to fragmentation. Attempts to grasp the object delicately may mean an insecure hold while more forcible application of forceps may break a large nut fragment into several smaller ones. The dangers of this situation are quite obvious. If the portion held by the forceps is retained and removed, there is the possibility that smaller pieces may yet remain behind unknown to the operator unless subsequent symptoms indicate that removal was not complete. This is the more likely since the smaller fragments may easily descend to a lower position in the bronchial tract, at a level too low to permit visualization through the bronchoscope. Occasionally such smaller fragments may be coughed up spontaneously but one can hardly rely on this fortunate accident with any confidence. What is far more hazardous is the possibility that a relatively large fragment may be broken off and aspirated into the previously unobstructed bronchus in which case, if the originally affected side be in any degree occluded by inflammatory reaction, there will occur a bilateral obstruction with asphyxia, calling for immediate removal of the loose secondary fragment, if a fatality is not to ensue. Such was the situation in one instance, where only prompt retrieving of the fragment of peanut from the opposite lung saved the patient from asphyxiation. This unpleasant situation is most likely to arise when the original nut portion was in the trachea and so large as to prevent its entrance into either bronchus. If fragmentation then ensues in the process of removal, smaller, but still good-sized, pieces may then easily occlude both bronchi almost simultaneously.

To check up on this situation and to avoid so far as possible leaving of unremoved nut portions in the lung, we have made it a practice to auscultate the lungs before the termination of bronchoscopy. If the quality of the breath sounds in any way suggests gross failure of air to enter one side of the chest, further search is immediately made for another portion of the foreign body. This plan is based on the fact that in most instances, even after prolonged sojourn, an occluded lung will resume its function almost immediately after removal of the obstructing foreign body, at least to such an extent as to make further gross obstruction quite obvious to the stethoscope. In this way, it may be possible to avoid the necessity of a secondary bronchoscopy at some later date.

A review of our cases reveals the fact that in fifteen instances the nuts were removed in a single unit and in eleven, as two or more fragments. In this connection, like most operators, we have had bizarre experiences in which a fragment detached from the original object has been coughed up through the bronchoscope or, impinging against the end of the tube, has been extracted with it, but such events are far more a matter of good luck than good management and should not be relied upon to supplant a properly executed method of forceps removal. Recently a technique of nut removal by aspiration has been advocated by Dr. Campbell Smyth and would appear to have at times certain distinct advantages over the use of forceps.

In the few instances in which the nut lay loosely in the trachea, some modifications of technique were necessary. Here the risk of the object stripping off the forceps at the narrower subglottic space is greater and the need for a firm hold is all the more important. Were the nuts to become jammed at this point, serious respiratory obstruction would inevitably result. It would then be necessary to return the foreign body to a lower level and reapply the forceps more firmly, but with the ever-present risk of breaking it into small pieces.

Multiple bronchoscopic examinations were necessary in five of our cases. In two of them this was the result of the failure at the first or second examination to locate any foreign body. It is surprising how such an examination, though carefully carried out, may at times fail to reveal a foreign body which on a subsequent bronchoscopy is at once quite obvious. Some slight change in position or alteration in local reaction usually accounts for this. In any event, it is a safe conclusion that, where history or physical findings strongly point to the presence of a foreign body, failure to observe it bronchoscopically on one or even two examinations does not guarantee its absence and further search should be made. So long as these examinations are reasonably spaced, such multiple bronchoscopies do no harm and are quite likely in the end to yield success.

The same may be said of multiple bronchoscopies in which removal of remaining frag-

ments is deliberately delayed till a later date. It may be far more advisable to terminate the operation with this end in view, provided the patient's condition is satisfactory, than to prolong the first examination unduly.

Our series shows three instances in which this plan was carried out with ultimate success. Fragments were deliberately allowed to remain with the idea of removing them at a second sitting. Since these fragments would, of necessity, be smaller than the original, it is quite unlikely that they would give rise to any serious, sudden obstruction. Naturally, the more extensive one's experience with this type of case, the less frequent would be the necessity of secondary removal of fragments.

COMPLICATIONS

Theoretically the skilful removal of a nut fragment in its entirety from the trachea or bronchus should not be followed by any complications attributable to the operative procedure itself. Obviously, such an achievement must depend primarily on the skill of the operator and the extent to which any trauma is avoided. Apart from this aspect, it is quite obvious that in certain instances when the foreign body has been present for an undue length of time, or when it has induced a high degree of local reaction, there will be present, even after rapid and skilful operative removal of the entire nut fragment, certain abnormal physical findings which, however, cannot be properly classified as complications. Residual suppuration in a lung or localized inflammation may not infrequently require time for its subsidence and the patient may, during this period, exhibit evidence of pulmonary involvement in spite of anything that the operator can do and for which he is in no way to blame.

Such conditions as laryngeal edema, evidence of residual fragments of nut, or unexplainable febrile reaction with or without signs of pulmonary involvement not previously present, must be regarded as true complications and hence indicative of a situation which requires explanation and perhaps additional therapeutic measures.

Viewed in this light, the present series of cases here analyzed presents certain interesting facts. In seven instances there was absolutely no postoperative symptomatology, indicating that the preoperative effects of the nut were so slight as to produce no residual signs and that the postoperative reaction itself was nil. This is the ideal type of case, with a result dependent on an early diagnosis, prompt and rapid removal, and the fortunate absence of any violent reaction on the part of the respiratory tract to the nut itself.

In ten cases, there is a record of some symptomatology, such as fever, brassy cough, purulent expectoration or physical signs of pulmonary involvement, all of which, however, subsided or disappeared spontaneously without requiring any further bronchoscopic or surgical procedure. In all of these, one must consider the findings as due primarily to the marked effects of the presence of the nut, rather than as complications of its removal. It is quite possible that in certain instances, the operation of removal may have temporarily aggravated these symptoms, but in view of their gradual subsidence, they may fairly be excluded from the group of truly operative complications. Nevertheless, all such signs and symptoms must be carefully watched and interpreted so long as they are present and in the event that suspicion is aroused at any time that the case is not proceeding satisfactorily, further bronchoscopic examination might be advisable primarily on the suspicion that a small fragment of nut still remained in the lung. To allow this situation to go unrecognized and untreated would, of course, be to subject the patient to still more prolonged lung suppuration. The length of time before one would intervene secondarily for such a situation would, of course, depend on the degree of pathology present at the time of the original bronchoscopy. The greater the initial involvement of the lung, the longer would be the expected period of convalescence following removal of the nut. Frequent checking by physical examination and x-ray will usually indicate whether satisfactory progress is being made.

In eleven cases there is a record of symptoms plainly indicative of an unremoved fragment of nut. In three of these, there was a prompt subsidence of these symptoms following secondary removal of the remnant, and in a fourth, the patient coughed up the remnant spontaneously. Fragmentation has already been discussed and it only remains here to reiterate that such an accident must always be borne in mind as a possibility and as an explanation for signs and symptoms which do not satisfactorily clear up. It is an accident which will occur less frequently as the operator becomes increasingly skilful in the work, but one which the average bronchoscopist must expect to deal with from time to time. So long as the situation is recognized in time, a secondary removal will do no harm and will usually be followed by a prompt subsidence of the residual signs which furnished its indication.

In Case No. 2, three bronchoscopies were required for successful removal, because at the first two examinations no foreign body could be seen. Such a negative examination, while disappointing, is not to be deplored, provided it adds no further traumatic disturbance to the airways. It by no means rules out the presence of the foreign body, if the suspicious signs and symptoms persist unchanged. "Try again" is

a good bronchoscopic motto, when a foreign body is strongly suspected and not found at the first or even at the second examination.

In two instances, it was necessary to carry out further procedures for postoperative laryngeal obstruction. In one of these there was no obvious explanation for the development of the complication, since it followed a short bronchoscopy for removal of an almond fragment of brief sojourn. Since the condition was considered to be one of purely postoperative laryngeal edema, direct intubation was carried out with only temporary relief. Tracheotomy was next resorted to, following which there developed typical signs of low tracheobronchial infection, with the production of inspissated crusted secretions which required bronchoscopic removal on four occasions. The picture at this time was typical of what we have elsewhere described as acute laryngo-tracheo-bronchitis. Fortunately the severity of the symptoms gradually abated in a few days, but it was four weeks before decannulation could be accomplished. Though none of these complicating signs was present before bronchoscopy, it is possible that this case was one of so-called arachidic bronchitis, a possibility made more likely since the almond is said to be particularly likely to cause such a severe reaction.

Two bronchoscopies were once required for complete removal of the foreign body and the laryngeal edema was unquestionably a purely postoperative one. It was relieved entirely by intubation but since extubation could not be achieved after two trials, it was thought wiser to resort to tracheotomy, from which the convalescence was uneventful. Such a complication can most certainly be attributed to the operator's lack of skill in removing the entire nut at the first sitting, though at the time it was thought best to discontinue the bronchoscopy after the first portion had been extracted.

We had hoped to be able to report this small series of cases of nuts in the respiratory tract without having to record a fatality, but the otherwise unbroken run of successful results was marred by one case. This patient had previously been treated elsewhere as a case of pneumonia and only after further scrutiny into the history five weeks later was the suspicion of inhalation of a peanut elicited. Transfer to the Children's Hospital was made at once, and a bronchoscopy without anesthesia performed. An obvious nut fragment was seen occluding the right main bronchus. This was grasped and removed, but the portion recovered seemed smaller than that seen through the bronchoscope. As further search was being made for the remainder, the child suddenly ceased to breathe, and, still more alarming, no heart sounds could be heard. In spite of all the classical methods of resuscitation, no signs of life were evident from the moment of suspended respirations. Immediate search of both bronchi failed to reveal any further peanut fragments and since autopsy was refused, it was never possible to determine the cause of death. As a result of a prolonged illness, the patient was undoubtedly in a greatly debilitated state and it would perhaps have been wiser to have postponed bronchoscopy until some such supportive measure as a transfusion or intravenous glucose might have aided in raising the preoperative resistance. The suspicion that the entire nut fragment was not removed still leaves open the possibility that the remaining portion entered the previously unobstructed bronchus though the signs were much more those of cardiac collapse than of bilateral bronchial obstruction.

SUMMARY

Twenty-six cases are reported of nuts aspirated into the respiratory tract and removed by bronchoscopy. The importance is stressed of inquiring into the possibility of aspiration in taking the history of any case of unexplained pulmonary pathology. The characteristic physical findings are summarized and shown in the majority of instances to be quite typical in this condition. X-ray findings are summarized and the typical findings illustrated and variations explained.

The question of anesthesia is discussed, and the merits of no anesthesia, avertin per rectum and ether are considered.

Bronchoscopic findings are analyzed, and the problem of fragmentation of the nuts is dealt with in detail.

Complications are considered and estimated according to the immediate or later effects, together with the measures, such as tracheotomy or intubation, necessary to combat them.

End results show twenty-five permanent recoveries and one death.

Since this paper was written three additional cases have been operated on without incident.

REFERENCE

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INCONTINENCE OF URINE DUE TO URETERAL ECTOPIA*

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INTRODUCTION

IN studying a case of urinary incontinence the rare congenital anomaly of ectopic ureter should be considered. Although the comparative rarity of the condition is evidenced by the fact that nearly all contributors have reported but one, or in rare instances two, of their own cases, the increasing frequency with which reports have appeared in the literature during the past decade indicates that in many instances the true diagnosis has not been suspected. As will be seen in the following report, there are many cases in which the picture is a puzzling one and in which apparently careful study and consideration have failed to reveal the true cause of the incontinence.

By the simplest of procedures, it is readily possible for the general practitioner to rule out all other possible causes of dribbling while the urologist may, with the diagnostic aids at his disposal, make an anatomic and functional diagnosis that will greatly facilitate the choice of surgical procedure which will result in permanent cure.

CASE REPORT

Miss E. E., a sixteen year old schoolgirl, was admitted to the hospital on October 27, 1933. At that time she complained of constant dribbling of urine, both nocturnal and diurnal, since infancy. Associated with this she passed normal amounts of urine from the bladder from four to six times a day, had the usual feeling when the bladder was full, with complete relief of this after voiding. Although the dribbling varied considerably in quantity from day to day, she used on an average six to eight perineal pads during the twenty-four hours. She gave no history of other genito-urinary symptoms, particularly she denied urgency, frequency or burning on micturition. To the best of her knowledge the urine had always been clear and of normal color without pus or blood.

Except that her mother had died of pulmonary tuberculosis to which the patient was exposed, there was no history of familial disease. Two brothers were living and well. There had never been a similar malady in any member of her family.

In early childhood she had suffered the usual diseases of that period. General systemic history was entirely negative. Menses began at fourteen, normal and regular since.

Her first hospitalization was in April, 1930. At that time examination showed a "tiny opening" just to the right of the external urinary meatus, through which urine dribbled at periodic intervals, especially on standing or straining. Cystoscopy revealed what was believed to be the internal opening of an accessory urethra, midway between the internal urethral orifice and the right ureteral opening. Otherwise the bladder appeared perfectly normal with two normal ureteral orifices normally placed.

During her eight weeks of hospitalization, five attempts were made to stop the dribbling by injection of caustics. These included 10 per cent silver nitrate, silver nitrate stick, and 2 per cent tincture of iodine. Following the third cauterization there was relief of symptoms for five days. Finally she was discharged unrelieved.

On June 12, 1930, she was again hospitalized and, after a second cystoscopy, during which it was believed that the internal os of the "aberrant urethra" was seen, she was operated upon. Through a midline incision the bladder was opened and what was believed to be a small opening discovered midway between the internal urethral opening and the right ureteral orifice. The opening would not admit a probe. However, the edges were denuded and bladder mucosa closed over the opening. The bladder wall was closed in two layers. Internal genitalia were normal except that the left tube was adherent to the sigmoid. This was separated and, after suspension of the uterus to the anterior abdominal wall, the latter was closed in the usual manner. The uterovesical space was drained and a self-retaining catheter inserted into the bladder through the urethra from below.

Postoperative wound healing was entirely uneventful. As long as the retention catheter remained in the bladder there was no urinary dribbling. However, on removal of the catheter the dribbling continued to be as bad as before operation.

In October, 1933, the patient was admitted to the Urological Department of the Fifth Surgical Service of the Boston City Hospital. At that time examination revealed a well-developed and nourished girl of sixteen, intelligent and coöperative, and in no apparent distress. General examination was entirely negative. Examination of the external genitalia revealed a periodic flow of clear urine escaping from a point which appeared to be just to the right of the external urethral meatus. The periodicity of the flow immediately suggested that it was due to the termination of an aberrant ureter. The bladder was filled with 2 per cent mercurochrome and it was noted that the escaping urine was not colored. Diagnostically this seemed to preclude any other possibility. After two prolonged and unsuccessful attempts to catheterize the para-urethral urinary sinus, the patient was given two ampules of diodrast intravenously. X-ray plates taken at periodic intervals revealed, after twenty-five minutes, normally placed and normal appearing kidney pelves and ureters on both the right and left sides. In addition, on the right side above the normal kidney pelvis, was a small, poorly filled, but definite third kidney pelvis. Unfortunately only a very slight and unsatisfactory visualization of the attached ureter was possible (fig. 1). However, not only did the test serve to confirm the diagnosis, but illustrated the functional unimportance of this third kidney with its attached aberrant ureter.

Cystoscopy done November 1, 1933, revealed a normal appearing bladder with two normally placed ureteral orifices. Both ureters were easily catheterized with No. 7 radiopaque catheters. Retrograde pyelography revealed normal appearing kidney pelves and ureters on both sides. The right

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kidney pelvis held 10 cc. of fluid, the left 8 cc. Urine specimens obtained from each side were microscopically negative. Intravenous injection of 5 cc. of indigo-carmine at this time, with the catheters still in the ureters, revealed normal concentration of the dye from each side. The appearance time on the left was three minutes, on the right three and a half minutes. Absorbent cotton placed over the site from where the dribbling seemed to come showed very slight but definite coloration. The latter test served to prove the fluid to be renal excretion, and again illustrated the functional unimportance of the kidney tissue connected with the aberrant ureter and its pelvis. The retrograde pyelograms illustrated the lack of any functional connection between the two kidney pelves on the right side. A third attempt to catheterize the para-urethral sinus was unsuccessful.

A final and successful attempt to catheterize the para-urethral sinus was made on November 16. At

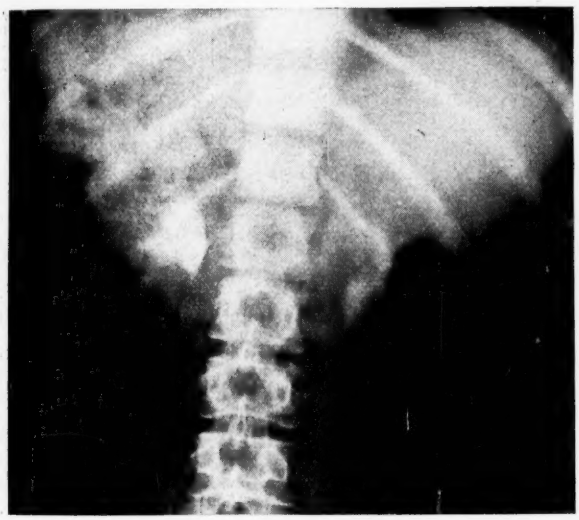

FIG. 1. Intravenous Uroselectan given to locate the extra kidney pelvis. Note the poor shadow showing just above and to the inner side of better shadow of the right kidney pelvis.

that time it was found that the sinus opened not, as had been suspected, to the right of the urethral orifice, but just to the right of the midline of the posterior lip of the urethral meatus, at the junction of the urethral and vulvar mucous membranes. The opening was effectually hidden by a small lip of extruding tissue which served to deflect the flow of urine upward and to the right of the urethral orifice. Once found, the opening was readily catheterized with a No. 7 filiform tipped ureteral catheter. The right ureteral orifice in the bladder was then catheterized with a No. 7 whistle-tip catheter. A roentgenogram revealed the bladder ureter catheter running to the level of the fourth lumbar vertebra. The catheter in the aberrant ureter ascended on the outer side of the normal ureter to the level of the upper border of the third lumbar vertebra where it crossed medially and anteriorly to the ureteropelvic junction of the lower pelvis, running up to the level of the first lumbar vertebra. The normal right ureter and kidney pelvis were then filled with 12.5 per cent sodium iodide solution and a roentgenogram taken. This catheter was plugged and the ectopic ureter and pelvis filled. The complete filling of both ureters and pelves revealed that the ectopic ureter led into a distinct kidney pelvis, infantile in type, not communicating with the normal kidney pelvis which was immediately below (fig. 2). Plates taken with the Roentgen tube centered over the bony pelvis served to demonstrate the relationship of the aberrant ureter to the bladder and urethra. The aberrant ureter passed posterior to the

FIG. 2. Pyelograms with catheters in place. The ectopic ureter passes first back of, then to the outer side and then crosses over anteriorly to the normal ureter, to its upper ill-formed pelvis.

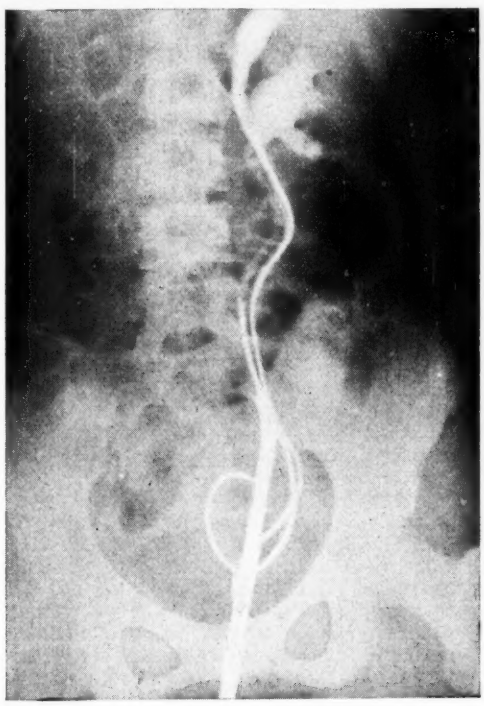

FIG. 3. Film was taken to demonstrate the course of the ectopic ureter, its relations to the normal ureter, bladder and urethra. The cystoscope left in place while the film was taken covers most of the catheter where it passes along under or posterior to the urethra.

urethra and neck of the bladder (fig. 3) following hereafter the outline of the right side of the trigone to the level of the insertion of the right bladder ureter, from where its course is as depicted above.

The conclusion was drawn that there was a double fused kidney on the right side with two separate kidney pelves, non-communicating, and two separate ureters, one of which emptied into the bladder with normal relationships, while the other did not communicate with the bladder in any way but ran down behind the bladder and emptied into the external urethral orifice as noted above.

Operation was performed November 20, 1933. The right bladder ureter was first catheterized after which a "hockey stick" incision was made to expose the right kidney. Both ureters were easily found and identified by feeling the catheter placed in the normal ureter. The ureter connecting with the upper pelvis was dissected free, and found to run anterior to the true pelvis and ureter at the ureteropelvic junction. The upper pelvis was funnel-shaped, infantile in type and connected with what appeared grossly to be perfectly normal kidney tissue. On the posterior aspect there was a shallow cleft dividing the upper one-inch of kidney tissue drained by the infantile pelvis from the lower three inches drained by the normal pelvis. The upper portion of kidney tissue and its pelvis were found to have their own separate blood supply coming apparently from the main renal vessels. The shallow cleft separating the two individually drained portions of kidney tissue was found not to constitute a complete anatomical separation making it necessary to amputate the upper portion by means of sharp dissection. Bleeding from the main portion of kidney tissue was controlled by means of deeply placed catgut sutures. The ureter connecting with the upper pelvis was dissected down almost to the brim of the bony pelvis, was then clamped, cut, cauterized and tied. The abdominal wall was closed in layers in the usual manner with one cigarette drain placed to the cut surface.

FIG. 4. Specimen with its ureter removed at operation.

Following operation the patient made an uneventful recovery save for slight wound sepsis which was easily controlled. The patient was discharged on the twenty-first postoperative day. Since operation she has been completely free from all signs of urinary dribbling. There has been a complete change in her mental attitude following the alleviation of her very distressing symptom complex.

We are indebted to Drs. Frederick Parker, Jr., and Beach Hazzard for the following description of the surgical specimen (fig. 4):

"The specimen consists of a piece of kidney tissue with 6 cm. of ureter attached. On the posterior surface are several linear depressions two of which begin as distinct lines on the lateral aspect of the kidney. These converge toward the pelvis to form a 'V.' The apex is located 0.7 cm. from the junction of the ureter with the pelvis. A shallow linear depression extends down from the superior surface and joins the upper of these two near their junction.

"The anterior surface shows one distinct and rather deep fissure 3 cm. from the superior pole. The capsule is thin, strips easily from the surface of the kidney tissue.

"Longitudinal section shows a small pelvis about 0.8 cm. in greatest diameter from which a patent ureter of normal size extends. One narrow band of grayish-white tissue continuous with the middle linear depression on the posterior surface extends in as far as the pelvis and in such a way isolating a nodule of kidney tissue oval in shape and 1.4 cm. in greatest diameter. This nodule is pale brownish-purple in color and the markings are distinct. The cortex measures 0.4 cm. in thickness. A pyramid is distinctly seen extending toward the upper portion of the pelvis. The tissue inferior to this fibrous band is continuous with the tissue of the normally drained portion of the kidney. The tissue is of similar color to that of the small nodule previously described, the markings are distinct, the cortex measures from 0.4 to 0.5 cm. in thickness. One pyramid extends upward and medially to the lower portion of the pelvis.

"Microscopical description: The specimen consists of two roughly triangular pieces of kidney tissue connected by an area of connective tissue. This band of connective tissue extends from the capsule to the pelvis and contains several large blood vessels, and a group of dilated tubules, filled with dense, red-staining secretion, and lined with thinned-out epithelium. At other points in this fibrous tissue there are isolated tubules. At one point near the capsular surface some fat cells are present. There is an infiltration of lymphocytes in the connective tissue beneath the pelvic epithelium, with a marked focal collection at one point. The kidney parenchyma in the two segments mentioned above appears identical as regards the structure and morphology of its various elements."

REVIEW OF THE LITERATURE

For a complete review of the literature on this very interesting anomaly, the reader is referred to the excellent papers by Thom[34], Kilbane[21], and Sargent[30]. Winfield and Higgins[36] have recently (1932) added one case and brought the literature to date. According to the latter authors, the first reported case of ectopic ureters was discovered at autopsy by Schrader in 1674. The patient, a young girl, was found to have congenital absence of the bladder with both ureters opening into the vestibule of the vagina. Madden[25] in 1884 presented before the British

Medical Association the case of a sixteen year old female who presented symptoms of "incessant dribbling for years" together with the "power of retaining and voiding a certain quantity of urine at long intervals". He found a fistulous opening one-half inch above the external urethral meatus which would admit a No. 1 catheter to the full length. It was his opinion that the dribbling was due to some malformation of the right ureter and he proposed implantation into the bladder. The patient refused operation. Undoubtedly this was a case of aberrant ureter ending extravesically, for the symptomatology and physical findings are typical.

Kilbane[21] has classified ectopic openings of the lower end of the ureters as follows:

1. "Single Ureter with Ectopic Opening." Begg[5] was able to find reports of only eight cases in the literature. Since then three more cases have been added (19, 33, 36) bringing the total to eleven. Only one case has been reported where the aberrantly drained kidney has normal function.
2. "Complete Unilateral Duplication of Pelvis and Ureters with Ectopic Opening of Supernumerary Ureter." This is by far the most common type, of which the case herewith presented is an example.
3. "Complete Unilateral Duplication of Pelvis and Ureter with Ectopic Openings of both Ureters."
4. "Supernumerary Kidney, Pelvis and Ureter with an Ectopic Ureter." The ureter from the most superior kidney is always the one that ends aberrantly. Separation of the two kidneys may be of any degree from connection with a fibrous band to complete separation. This is of no significance embryologically, being no more than the result of the degree of separation of the two ureteral buds on the Wolffian duct. However, it is of some importance surgically since separation makes resection of the aberrantly drained tissue considerably easier.
5. "Bilateral Duplication of Pelves and Ureters with one Ectopic Ending only." Probably second most common anomaly.
6. "Bilateral Duplication of Pelves and Ureters with Bilateral Ectopic Openings."
7. "Both Single Ureters having Ectopic Openings." Of these Thom[34] was able to find only six cases in a complete review of the literature. Kretschmer and Heaney[23] add to these a case which they observed, the first to be correctly diagnosed clinically. All of the cases found by Thom had been observed at autopsy.

Sargent[30], after a complete review of the literature including those cases reported by Thom, found 186 cases of aberrant ureter. Recently Winfield and Higgins[36] have added several cases from the literature and reported one of their own bringing the total to 194 reported cases. Of the 186 cases reported by Sargent, 123 were in females of whom twenty-nine were diagnosed at autopsy, the remainder clinically. Of the sixty-three cases in males only six were diagnosed clinically. The discrepancy between the proportion diagnosed clinically in females and in males is readily explainable. We shall see that embryologically the aberrant ureter must empty into the structures formed from the Wolffian duct or Wolffian tubules, i.e., in males the epididymis or its tubules, ductus deferens, seminal vesicle, ejaculatory duct or the dorsal wall of the prostatic urethra. In such event, the excretory products of the aberrantly drained kidney tissue must empty above the external bladder sphincter so that dribbling, the chief symptom in females, does not occur. Frequently such cases present no symptoms referable to the genito-urinary system. Davis[7] was able to find only five cases in the literature where the aberrant ureter ended below the bladder sphincter in females without an associated incontinence. To these he added a sixth which he had observed. The usual explanation for the lack of incontinence, as in Kolisko's case (Davis[7]), was that the aberrant ureter passed through the bladder wall in such a way as to be compressed by the bladder musculature except during the act of micturition when the compression was released and the dilated ureter allowed to empty.

ETIOLOGY*

In order to understand the etiology of ureteral ectopia it is necessary to briefly review the embryology of the genito-urinary organs.

In the human embryo of nine to ten primitive segments (1.7 mm.) the pronephros, the first of the primitive kidneys, develops. It reaches full development at 2.5 mm. (23 segments) when it consists of seven pairs of rudimentary tubules each in intimate relation with a capillary to form the earliest filtering apparatus. None of these tubules lie caudal to the fourteenth primitive segment. The collecting tubules, by a process of elongation, join with each other to form the pronephric ducts, one on each side, which, growing in a caudal direction, elongate until they come to empty into the lateral walls of the caudal expansion of the entodermal

*We are indebted to Drs. J. Lewis Bremer and H. L. Weatherford of the Department of Anatomy of Harvard Medical School for criticism and suggestions concerning this portion of the paper.

canal, the cloaca. The pronephros is but short lived, having completely degenerated in embryos of 5 mm. The earlier appearing tubules begin to degenerate before the later ones are completely formed.

It is probable that the pronephros never acts as an excretory organ in mammals, its only importance being in the pronephric duct, which, at first, a solid cord of epithelial cells, becomes finally a hollow tube, the primitive ureter.

Even while the pronephros is degenerating the second excretory organ is developing in a slightly more caudal position. At its cranial extremity, this organ, the mesonephros, develops from the segmented nephrostomes. However, caudal to the tenth primitive segments the nephrostomes fuse, bulge from the posterior body wall into the coelom or body cavity to form the nephrogenic cords, which are paired and unsegmented. Continuing to proliferate, the cells of the nephrogenic cords bulge more and more into the coelom, become known as the urogenital folds which extend from the sixth cervical to the third lumbar segments. A longitudinal infolding later divides this urogenital fold into the mesonephric fold lying laterally, and the genital fold lying medially. From the latter arises the genital gland and from the former the mesonephros. First solid cords, then hollow tubules form within the mesonephric blastema coming in contact at one extremity with tufts of capillaries, at the other emptying into the pronephric duct which now becomes known as the mesonephric or, more commonly, Wolffian duct.

While the mesonephros is developing new tubules caudally, those at the cranial end begin to degenerate in embryos of 10 mm. In all eighty-three pairs of tubules arise. The mesonephros constitutes the adult kidney in certain fishes and amphibians.

The adult human kidney or metanephros does not develop until after the mesonephros has been formed. It has two points of origin. The ureteral bud arises from the lower end of the Wolffian duct near where it enters the cloaca. Growing at first dorsally and then cranially its cranial extremity becomes enlarged, divides into an upper and lower sprout. The enlarged end is to become the pelvis of the kidney, while the portion intervening between it and the Wolffian duct is to become the ureter. The division of the cranial extremity into upper and lower segments forms the two major calyces, while further subdivision of these primary divisions gives rise to the minor calyces and collecting tubules. During the cranial growth of the ureter and pelvis, the latter becomes surrounded by the blastema of the metanephros which is to develop into the cortex of the adult kidney. From this tissue form the glomerular capsules and renal tubules. The renal tubules early connect with collecting tubules formed from the subdivision of the pelvis.

During the course of this development of cortex and medulla, the ureter is constantly increasing in length and there is a cranial migration of the organ as a whole, which, lying at first at the level and in front of the second sacral vertebra, comes finally to the mid-lumbar region where the pelvis, which until now has faced ventrally, rotates to its normal medial position. Permanent vascularization of the kidney is not affected until the organ has reached its normal position, as evidenced by the right angle which the renal vessels make with the aorta and vena cava. This has been completed by the end of the second month of fetal life.

During the course of the development of the kidney and its drainage system, the cloaca, which in early fetal life forms the caudal extremity of the enteric canal, becomes divided by a septum into the dorsal rectum and the ventral urogenital sinus. Division is accomplished in such a way that the Wolffian ducts empty into the latter. From the fourth week on, the lower ends of the Wolffian ducts expand at their distal extremities to form cavities which eventually become indistinguishable from the cavity of the urogenital sinus, of which they come to form a part. Thus, while the ureter retains its original position on the Wolffian duct, because the latter comes to form a part of the bladder wall, the ureter ends finally directly into the cavity of the bladder.

The expanded lower portions of the Wolffian ducts fuse in the midline posteriorly while the lateral and posterior lips continue to grow downward forming successively the trigone of the bladder, the dorsal wall of the female urethra (prostatic urethra in the male), and of the vestibule of the vagina[5]. The downward course of the lower ends of the Wolffian ducts being eventually stayed, the upper portions have in the meantime descended with the genital gland which has formed from the genital fold, which, it will be recalled, at first lie ventromedial to the mesonephros (now degenerated). In the female, the ovary having descended into the pelvis, the upper portion of the Wolffian duct degenerates to form the vestigial structure known as Gaertner's duct. In the adult this structure runs from the epoöphoron through the broad ligament. At about the level of the internal os it penetrates the musculature of the uterus, runs down the lateral wall of the vagina to open externally at or near the free border of the hymen. Remnants of this structure are demonstrable in about 25 per cent of adults[18].

In the male, the Wolffian duct comes to form the epididymal duct, ductus deferens, ejaculatory duct, seminal vesicle and a portion of the prostatic urethra.

In the female, the Fallopian tubes, uterus and

vagina are formed from the Müllerian ducts which, developing at first lateral to the Wolffian ducts, cross over them to fuse in the midline. It is this fused portion which forms the uterus and vagina, the caudal extremity marking the position of the hymen. In the male, these structures degenerate, only the lower extremity remaining as the vestigial prostatic utricle, while the extreme cranial ends may remain as the so-called appendix testis.

Having thus considered the normal embryology of these structures, what embryological defects give rise to the ectopic ureters of which this case is an example? It is at once evident that if the primary division of the primitive kidney pelvis into major calyces takes place too early, a bifid ureter will result. The earlier the division, the lower (toward the bladder) will be the branching of the ureter. Very early division will result in two complete ureters emptying near each other into the bladder. On the other hand, if instead of one ureteral bud arising from the Wolffian duct, there are two, both will grow into the metanephric blastema, forming two separate and complete drainage systems consisting of collecting tubules, calyces, pelves and ureters. The renal blastema may or may not become separated into two separate kidneys. Usually there is no anatomic separation though there is often a shallow lobulation on the surface to mark the separation of the two. It is an invariable rule that the ureter draining the superior of the two pelves will open the lower in the genito-urinary tract. This is explained by the fact that the expansion of the lower end of the Wolffian duct is not uniform, the bladder and urethra being formed more at the expense of the lateral and anterior walls of the urogenital sinus than of the posterior. During descent all structures arising from the Wolffian duct will retain the same relative positions; thus, if the ureteral bud is low before the beginning of the expansion and descent of the Wolffian duct, it will be implanted high on the bladder wall in the adult. Conversely, if it arises high on the Wolffian duct, implantation will be correspondingly low. If the ureteral bud arises so high on the Wolffian duct that it remains attached to the latter structure after descent has been completed, then the adult ureter will empty into the persistent Gaertner's duct in the female, probably kept patent by the continual passage of urine through it[5*]. In the male it will similarly open into one of the structures formed by the Wolffian duct, viz., the ductus deferens, ejaculatory duct, seminal vesicle or prostatic urethra. Pohlman[28] has observed two ureteral anlages arising from the same Wolffian duct in two fetuses of 13 and 24 mm. respectively.

Thus in the present case, it is logical to assume that the ectopic meatus found just within the external urethral orifice is the persisting remnant of the lower end of the Wolffian duct, i.e., Gaertner's duct; that somewhere above the external orifice the true ureter joins it, though the two may or may not be distinguishable as separate structures.

It is very evident that the lower end of the ureter may itself terminate aberrantly below the level of the bladder sphincter instead of into Gaertner's duct. In such an event the origin of the ureteric bud would be at such a level that the lower end of the ureter would terminate at a point on the Wolffian duct at or below the lowest point of descent of the caudal extremity of the latter structure. It is Begg's[5] opinion that in those cases where the termination is in the vestibule, Gaertner's duct forms the caudal portion.

Spitzer and Wallin[32] have suggested that the aberrant kidney tissue and drainage system are no more than an adult Wolffian (mesonephric) system. They base their opinion on one case of bilateral ectopic ureters which unfortunately refused operation, but whose pyelograms showed that there were "no pelves in connection with the ectopic ureters, but they appear to end rather blindly at the upper poles of the kidneys. Such a relationship indicates that there is no true kidney structure present. It appears likely that the tissue connected with the ectopic ureters represents a persistence of mesonephric tubules." They further add that in the few cases in the literature where nephrectomy or hemi-nephrectomy has been done and the specimens examined microscopically, the usual report of the pathologist has been hydronephrotic kidney tissue. Since "mesonephric tubules and glomeruli are considerably larger than the same structures in normal kidneys, it seems not unlikely that a cursory examination of mesonephric tissue may be mistaken for hydronephrotic tissue." A glance at the pyelograms from the case herewith presented shows that the ectopic ureter also appears to end "rather blindly" at the upper pole of the kidney, presenting a picture very similar in fact to the one described by Spitzer and Wallin. Yet, in the present case, the upper dilated ending of the aberrant ureter was certainly connected with true kidney tissue, not destroyed by chronic obstruction of the ureter as is usual. Further it seems unlikely that mesonephric tissue would be mistaken for hydronephrotic tissue when the latter presents such a characteristic picture of obliteration of glomeruli which are converted into fibrous nodules or else surrounded by a thickened fibrous capsule with marked increase of the interstitial connective tissue[6, 26].

Kraft[22] agrees with Spitzer and Wallin that

*Fusion with the Müllerian duct may give rise to a ureter emptying into Fallopian tube or uterus. This has been reported in a few cases of non-viable fetuses where other congenital abnormalities were also present[20]. It is of no importance clinically.

the ectopic system is probably a remnant of the Wolffian system because: (1) "The connection (of the aberrant ureter) with the upper pole of the kidney may be by adhesions only and not by collecting tubules." This is of little significance embryologically. Many cases have been reported in which the upper ends of an aberrant ureter ended blindly without functional connection with renal tissue. (2) "That the epithelium may vary from intestinal type of columnar to stratified transitional epithelium which should not occasion surprise as the anlage is derived from the cloaca." That the anlages of neither the Wolffian system nor the ureters proper are derived from the cloaca has been amply shown. Rather is the Wolffian system mesodermal, whereas the cloaca is entodermal in origin. It is extremely doubtful if the peculiarities of the lining epithelium of the ectopic ureter in Kraft's case can be properly used to indicate a different embryological origin. (3) "That the mucosa contains intestinal-like glands and lymphatic tissues that suggest intestinal structure." In some animals mucous glands have been found extending into the tunica propria of the ureter and there are gland-like structures in man though some of them have no lumen, and it is said that none are true glands[24]. This probably accounts for the microscopic picture seen in Kraft's case.

Further evidence that the ectopic system is not of Wolffian origin is seen in the location of the aberrantly drained renal tissue. It is the universal finding that such tissue is found at the upper pole of the normally drained tissue. If of Wolffian origin it seems not unlikely that the secreting tissue and its attached duct would, during embryonic development, descend into the bony pelvis and be located at or near the ovary just as is Gaertner's duct, which is the vestigial remains of the Wolffian duct in the female. In the present case, we are certain of the normal location of the internal genitalia from the first operation.

PATHOLOGY

This has already been briefly considered under the heading of Embryology. It should again be emphasized that it is invariably the upper pole of the kidney which is drained by the aberrant ureter. In cases where there are three or more distinct kidneys, it is always the ureter from the most superior which opens in an ectopic position below.

In the majority of the cases reported in the literature, there is evidence of inadequate drainage. This is seen in the dilatation of ureter, pelvis and calyces, with pressure atrophy of the cortex and medulla. Hydronephrotic changes may be so pronounced that the cortex is thinned to a mere shell. Microscopically there is extreme atrophy of the renal tubules with an associated round cell infiltration and interstitial fibrosis. The epithelium lining the tubules becomes flattened and the glomeruli obliterated and fibrosed. These changes are frequently present only in the aberrantly drained portion of kidney tissue, that portion drained by the ureter normally inserted into the bladder, being normal in appearance. Or, if there is also blockage of the normally inserted ureter, both portions of the kidney may show hydronephrotic changes of the same or different degree.

With stasis, which in the majority of the cases is present, there is an often associated infection, changing the pathologic picture to one of pyonephrosis or pyelonephritis. This may likewise affect one or both halves of the kidney. The kidney pelvis and ureter, both dilated from back pressure, also take on the characteristic changes of acute or chronic infection.

In addition one should keep in mind that the aberrantly drained kidney, pelvis and ureter are heir to all the diseases to which normally drained kidneys are subject. This may include calculous formation, tuberculosis, neoplastic disease, etc. The importance of this consideration will be more fully discussed under Treatment.

SYMPTOMS AND DIAGNOSIS

In males, as has been stated, the ectopic ending of an aberrant ureter frequently gives no symptoms whatsoever. In those cases diagnosed during life, the symptomatology has usually been dependent upon urinary stasis with infection. Day's case[9] presented a picture of hematuria following slight trauma. Only one ureteral orifice was found in the bladder, the other being found in the prostatic urethra.

In females, the cardinal symptom is dribbling, usually both diurnal and nocturnal, associated with normally controlled filling and emptying of the bladder at periodic intervals. The dribbling usually dates from birth which effectually rules out vesicovaginal or vesico-urethral fistula. It is interesting to note, in reviewing the literature, that in a great many cases the diagnosis has been made by filling the bladder with dye (methylene blue, mercurochrome, etc.) and noting the escape of clear urine from the vagina, urethra or vestibule. This test is pathognomonic of an aberrant ureter terminating below the bladder sphincter.

The fistulous ectopic opening is frequently very difficult to find, often being effectively hidden by a fold of the mucosa of vagina or urethra. In the case here reported, the opening was hidden by a small tab of tissue which not only covered over the opening but deflected the course of urine upward, giving at first an entirely erroneous impression as to the site of exit. It is preferable to find and catheterize the ectopic ureter so that, with the aid of pyelography, an exact anatomic diagnosis can be made before operation. Cystoscopic examination may give some hint as to the side from which the ectopic ureter arises. Swan's[33] case

showed a deficiency of one side of the trigone with the corresponding ureteral orifice located at the bladder neck, distal to the sphincter muscle. Begg's[5] case, cystoscopically, showed the right ureteral orifice closer to the bladder neck than the left. Otherwise both were normal. Operation revealed the ectopic ureter arising from the upper pole of the right kidney.

Failing to find the external opening of the ectopic ureter, one may resort to intravenous pyelography, though this is frequently unsuccessful due to low functional capacity of the ectopically drained kidney tissue.

Once the ectopic ureter has been catheterized, urine should be collected and examined for evidence of infection, which is usually present. The bladder ureter of the same or both sides should be catheterized and roentgenograms taken to determine the anatomic relations. Frequently, it will be found that the catheter introduced into the ectopic ureter has coiled up in a cystic dilatation which is often present at the lower end. In this event, lowering the patient's head and slowly injecting pyelographic fluid will usually give an excellent picture. Pyelograms of the normally drained kidney tissue will frequently show a displacement or absence of the upper calyx of the affected kidney. This may be of further value if the ectopic ureter cannot be roentgenographically visualized, since it would then indicate the side of the deformity.

With a urethral catheter in the bladder a dye such as indigo-carmine may be injected intravenously. Some help in finding the lower end of the ectopic ureter may then be derived from placing pledgets of absorbent cotton in the vagina and vestibule. The approximate location of the opening will be shown by staining of the cotton, provided, of course, the aberrantly drained kidney tissue has sufficient functional value to excrete the dye.

Because it has a direct bearing on the surgical treatment of the condition, an attempt should be made to determine the functional capacity of the aberrantly drained kidney tissue. This can be most satisfactorily accomplished with properly draining catheters in both bladder and aberrant ureters. Intravenous phenolsulphonphthalein or indigo-carmine will then allow one to estimate the functional capacity of every source of excretion.

In making a diagnosis one should not overlook the possibility of more than one ureter ending ectopically.

TREATMENT

The treatment of ectopic ureters with incontinence, whether single or supernumerary, is purely surgical and to this end it is well for the clinician to keep in mind that the object of treatment is not only to cure the incontinence but to conserve as much functioning renal tissue as possible. With modern methods it is possible to make an exact anatomic diagnosis which will greatly facilitate the surgeon in determining the most desirable method of effecting a cure in individual cases. The literature abounds with unusual and often ingenious methods, the more important of which will be discussed together with a consideration of their worth. No attempt is made to detail the surgical technique since this is beyond the scope of the present paper.

The most obvious method of effecting a cure in these cases is, of course, implantation of the aberrant ureter into the bladder. Certainly this method has the advantage of conserving all the renal tissue present, but has the great disadvantage that if the urine delivered into the bladder is infected, symptoms of a severe and protracted cystitis may make the patient more miserable than did the constant dribbling. In cases where the kidney is drained by one ureter which ends ectopically and in which there is little or no infection with good renal function, this may be considered the operation of choice. Implantation by the suprapubic method, although entailing a more serious operation than by the vaginal route, has proved to be successful in a higher percentage of cases, although the number reported in the literature is not great[30].

A disadvantage of both methods is that occasionally the site of implantation becomes stenosed by cicatricial contraction, a condition that may eventually lead to hydro- or pyo-nephrosis with pain and the destruction of the renal tissue which has been so painstakingly preserved. This complication should become less frequent as the principles of submucous implantation are more carefully applied. The closely allied operation of ureterocystostomy was the first to be applied in this condition, and has been executed by the vaginal, urethral and transvesical routes. Although presenting the advantage of being a less severe operation, it has also the disadvantages common to vaginal and suprapubic implantation magnified to the extent that the new orifice in the bladder is even more likely to stenose.

Ligation of the ureter has long been known to lead to atrophy of renal tissue. This principle has frequently been applied to aberrant ureters by the vaginal route, occasionally by the abdominal route. Its chief advantage, by the former method, is the ease and safety with which the operation may be performed, although this, of course, does not hold good with the latter method. Both methods present the great disadvantage, where there is even a small amount of sepsis, that drainage is prevented leaving a focus of infection which may be most deleterious to the patient's general health, and may cause great local discomfort. Sargent was able to find two cases reported in the literature where abdominal ligation had been performed. Both cases were successful. Of nine cases where the

lower end of the aberrant ureter was ligated by the vaginal route (including three classified as vaginal excisions of a cystic dilatation of the lower end) only two were entirely successful. In a third, the success of the operation was questioned. This poor success is at least partly explained by the fact that not infrequently the lower end of the aberrant ureter has a wall that is so poor in muscular elements that the ligatures cut through long before atrophy of the renal tissue has been effected.

Nephrectomy presents the obvious advantage of assuring symptomatic cure in 100 per cent of the cases. Since ectopically drained kidneys are subject to the same disease conditions as normally drained kidneys, nephrectomy presents a field of useful application in curing not only the incontinence, which may be the presenting complaint, but other surgical diseases of the same organ which may be secondary to the ectopic drainage or independent of it. Examples include hydro- or pyo-nephrosis secondary to inadequate drainage with back pressure, whereas, renal tuberculosis, neoplastic disease, etc., may rarely be found as an accompanying but entirely independent pathological condition warranting removal of the entire organ.

Since the majority of cases of incontinence due to ureteral ectopia present the findings of a double kidney on one or both sides, always with ectopic drainage coming from the upper portion, it is well to include a brief discussion of the blood supply in relation to the type of operation to be recommended. In the present case, the upper ectopically drained portion received a separate blood supply coming from the renal vessels. Frequently the vessels supplying this portion come directly from the aorta and vena cava. Several cases, however, have been reported in which there has been only one external source of blood supply entering the double kidney in the region of the upper pole. Such an arrangement precludes any possibility of doing a heminephrectomy (see below), making extirpation of the entire organ a necessity if the condition is to be cured by operation on the upper urinary tract.

Heminephrectomy presents the operation of choice for it has the advantages of not only giving symptomatic cure in 100 per cent of cases with conservation of all functioning renal tissue, but allows for the removal of what is often a deleterious focus of infection. The availability of this operation is, of course, dependent upon the blood supply as noted above. The percentage of renal tissue drained by the ectopic ureter must also be considered, for if the greater portion is drained ectopically, whereas only a small portion drains into the bladder, heminephrectomy will obviously be contraindicated. Fortunately such a state of affairs may be ascertained preoperatively by means of functional dye tests and pyelography.

Certain unusual methods of treatment deserve mention in passing. Juvara (quoted by Kilbane[21]) reports a case in which two ureters drained a common pelvis, evidently the only case of its type on record. One of the ureters ended ectopically with dribbling. The obvious method of treatment was excision of the aberrant ureter.

Danzinger (quoted by Thom) reported one case in which the ectopic ureter was transplanted into the sigmoid. Operation was followed by death.

Stammler, Kummel and Graff (quoted by Kilbane[21]) each reported cases where anastomosis of the two pelves with excision of the aberrant ureter had been successful. Ureteropyelostomy and ureteroureterostomy have been suggested by several authors, although we have been able to find no reported cases in the literature.

SUMMARY

1. A case of congenital urinary dribbling due to aberrant ureter ending ectopically in the lower end of the female urethra is reported together with a brief review of the literature.

2. The etiology of the condition depends upon a developmental anomaly in which two ureteral buds grow from the Wolffian duct at some distance from each other. The more superior (cranial) of these always ends the lower in the urinary tract. Thus, if only one of two ureters from the same side ends below the bladder sphincter, it is always the one draining the more superior portion of renal tissue.

3. Pathologically the aberrantly drained renal tissue usually shows effects of chronic ureteral obstruction (hydronephrosis), usually but not always with superimposed chronic infection (pyonephrosis).

4. The condition occurs in both males and females. In the former it frequently causes no symptoms because the ectopic ending is above the external bladder sphincter. In females it characteristically causes urinary dribbling usually dating from birth and associated with normal filling and emptying of the bladder.

5. Filling the bladder with mercurochrome or other innocuous dye and observing the escape of clear, colorless urine presents a simple test which is pathognomonic of the condition.

6. Catheterization of the ectopic and normally ending ureters allows for exact anatomic and functional diagnosis which greatly facilitates the choice of surgical procedure to be employed.

7. Treatment is entirely surgical. A discussion of the types of procedures available and their indications is presented.

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REPORT OF A CASE OF PSOAS ABSCESS RESULTING FROM TUBERCULOSIS OF THE CERVICAL SPINE*

BY LOUIS ALPERT, M.D.†

INTRODUCTION: Sinus tracts that drain abscesses resulting from Pott's disease can become very tortuous and often extend far away from the site of the lesion. It is not uncommon to see a psoas abscess resulting from a low dorsal, or lumbar lesion, emerge somewhere along the lower part of the thigh and even in the popliteal region. But to see a psoas abscess in the groin, with its origin in the cervical spine is unusual and rare enough to deserve recording.

CASE HISTORY: G. G., aged twenty, was admitted to the Lakeville State Sanatorium in November, 1933, four weeks after a spine fusion was performed. The diagnosis of tuberculosis of the spine was made in October, 1933. However, the patient gave a history of having developed a sinus in the left cervical region at the age of three. This sinus drained on and off for many years and for the past six years it has drained continually. She showed no symptoms until four years ago when she developed pain in the region of the right scapula. This pain persisted and four years later in October, 1933 she reported to a hospital. There, the sinus in the neck was injected with lipiodol and revealed the sinus tract extending downward into the mediastinum on either side of the spine as far as the diaphragm.

A fusion of the cervical spine with osteoperiosteal grafts extending from the fourth cervical to the fifth dorsal inclusive was performed in October, 1933. Her postoperative convalescence was uneventful, except for a right-sided facial paralysis, which was noted immediately after the operation. This eventually cleared up.

On admission to Lakeville, the sinus in the left cervical region was draining freely. Her temperature was normal, the urine was negative, but the blood showed 16,800 leucocytes and 62 per cent neutrophiles. This count was considered high and could not be accounted for. A second showed 19,800 leucocytes with 75 per cent polys. A month later it was still essentially the same. The discharge from the sinus, which was profuse, was positive for tuberculosis on guinea-pig inoculation. The patient was placed in a plaster jacket and helmet.

Her temperature remained normal until January 13, when it rose sharply to 101.4. It then became irregular and began to fluctuate between 98 and 101 unaccompanied by any complaints or untoward symptoms.

On February 16, she complained of pain in her left thigh just below the groin and found it difficult to straighten her leg. Examination showed some spasticity and rigidity of the upper thigh muscles. The possibility of psoas muscle irritation was considered, and traction was applied to the left leg. Examination of the abdomen at this time was essentially negative. She continued to complain of pain in the left thigh radiating down the leg. Examination of the abdomen on March 15 revealed a firm mass in the left lower quadrant, extending down into the pelvis. A psoas abscess was considered. X-rays were therefore taken of the lumbar spine and these were negative. Likewise, x-rays of the pelvis and abdomen were also negative, except for a small lipiodol shadow at the level of the second lumbar vertebra, probably left over from the first injection of the sinus.

The possibility of the old sinus tract extending down into the pelvis, and a large abscess gravitat-

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ing there, was then considered. The sinus in the neck was injected with lipiodol with the patient on the x-ray table. Figure 1 shows the lipiodol in the

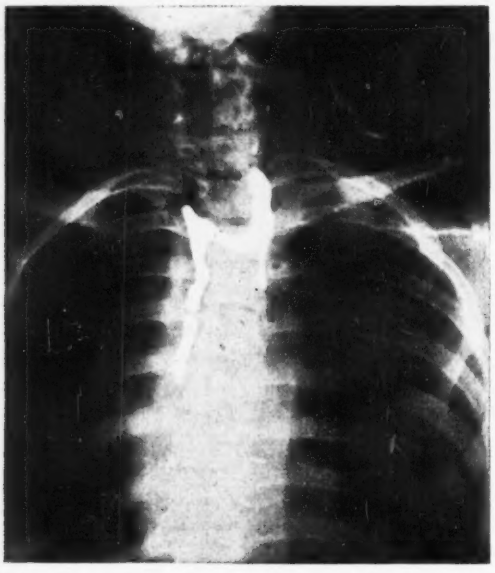

FIGURE 1. Shortly after injection of lipiodol in the sinus in the left cervical region, showing the oil crossing over to the right side of spine at the level of the third dorsal vertebra.

sinus crossing over from the left to the right paravertebral region at the level of the third dorsal vertebra. Figure 2, a plate taken a few hours later,

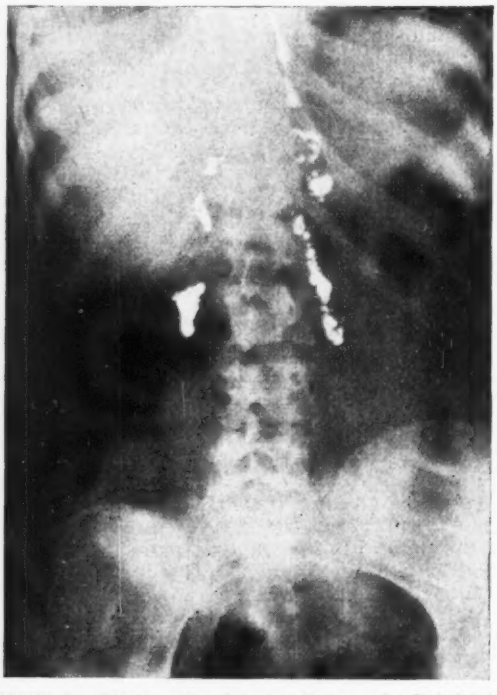

FIGURE 2. Taken a few hours following the lipiodol injection. It shows the lipiodol running down either side of the spine passing through the diaphragm and extending down to the level of the second lumbar vertebra.

shows the lipiodol extending down on either side of the dorsal spine, past the diaphragm into the abdominal cavity. Figures 3 and 4 taken three days later, show the oil extending farther down in the left pelvis in the region of the palpable mass. The direct extension of the sinus into the pelvis was thus demonstrated.

About the middle of April a fluctuant mass began to protrude in the left groin and the left leg became drawn up. Her temperature showed a marked rise in the afternoon and fluctuated between 98° and 103°. Her white blood count rose to 25,300 leucocytes and 77 per cent polys. On May 1, the mass in the left groin, which became soft and definitely fluctuant was aspirated. Thick grayish yellow pus

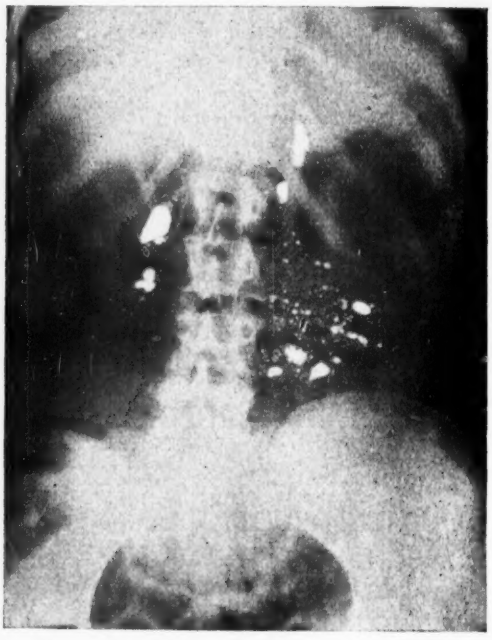

FIGURE 3. This picture was taken three days after the lipiodol injection. The oil is now at the level of the crest of the ilium on the left side and has become diffuse spreading out into the abscess.

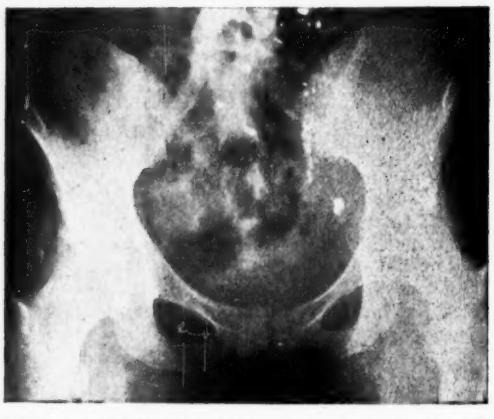

FIGURE 4. Taken four days after the injection of dye with lipiodol extending deep into the pelvis with the abscess apparently limited to the left side.

was withdrawn. It was then incised and about one and one half pints, or more, of thick pus was obtained. The examining finger was inserted and entered a large cavity, the upper part lying in the iliac fossa, and the lower part extending down into the pelvis. It was impossible to reach its lower limit. A rubber tube was inserted for drainage.

Following the incision and drainage, the patient's temperature dropped. She no longer had pain in the leg and was able to straighten it. Most of the toxicity disappeared and she looked and felt greatly improved. The sinus in the neck, however, continued to drain almost as profusely as before.

A culture of the pus recovered from the pelvis

was negative for any growth of the ordinary organisms.

DISCUSSION: Tuberculous abscesses of the cervical spine usually follow one of two courses. They either progress downward and become retropharyngeal, or else, influenced by the lateral muscles of the neck, empty either on the lateral aspect of the neck or into the supraclavicular fossae. The abscess under discussion, apparently followed both routes. It first emptied on the lateral aspect of the neck where it drained for several years. At the same time it continued its downward course by the retropharyngeal route down into the posterior mediastinum. Its passage past the diaphragm is of interest and leads to speculation.

There are several openings in the diaphragm through which the abscess could pass. Judging by the symmetrical distribution of the oil in both paravertebral areas, the sinus must have extended through the gaps between the medial, intermediate, and lateral crurae and then traveled along the sheath of the psoas. From there, it apparently limited itself to the left side. Having found a basin in the pelvis, the pus then began to accumulate until the quantity was sufficient to give rise to her temperature and to irritation of the psoas muscle with resulting pain and flexion of the left thigh. It is remarkable that, although the patient has been recumbent, the abscess should have gravitated into the pelvis, rather than have drained through the sinus in the neck. It remains to be seen whether the added drainage will be sufficient to lessen the toxicity and drain the abscess to the point of healing.

X-rays and photography by M. Bessie Hicks.

THE NEW HAMPSHIRE MEDICAL SOCIETY

ANTITUBERCULOSIS VACCINATION*

BY S. A. PETROFF, PH.D.†

THE most convincing proof of the effectiveness of the campaign against tuberculosis adopted years ago is the decline year after year in the death rate from this disease. Sociological and educational activities deserve the major credit for this decline as they have kept the public well informed of personal hygiene and prevention. The mortality decline should not in any way influence us in relaxing the campaign and we must at present ignore the statements made by some authorities that within a short time tuberculosis will be a disease of minor importance.

The tubercle bacillus is not normally found in nature and does not propagate outside the human and animal body. However, we must not overlook the fact that to-day, as formerly, the organisms are abundantly distributed and transported by civilization throughout the world, and the danger of infection to-day is just as great. A great deal, as stated above, has been done to reduce the mortality, but I believe that at present very much remains to be done to decrease the morbidity.

The prevalence of tuberculous infection among children, as demonstrated by tuberculin tests, reveals the fact that in about 40 per cent of those reaching puberty there is infection. If the contact with infection is only occasional and the number of organisms few, no serious consequence will occur and the infection will be localized, benign, and remain indefinitely hidden or latent. Such an infection can be revealed only by the tuberculin test. However, if a massive infection occurs, the outcome of such an infection may lead to an acutely progressive and fatal disease. The following statistics will give us a fairly good picture of the prevalence of tuberculosis infection among children covering a period of some twenty-five years.

Hamburger and Monti in Vienna reported 94 per cent positive reactions in children at the age of twelve. In rural districts in Germany, Römer found 66 per cent of the children infected at the age of eleven. Similar findings have been reported by S. Mueller in Berlin, Moro in Munich, Petruschy in Danzig and Northmann in Dusseldorf. In Paris 35 per cent of apparently healthy children up to the age of five gave a positive tuberculin reaction. Arnfinsen studying 8000 children of various ages observed a positive reaction in 33 to 38 per cent. In the United States the incidence of infection is not so great as that reported in European countries. Veeder and Johnston in St. Louis observed a positive tuberculin reaction in 44 per cent of the children from the ages of ten to fourteen. Slater studied two groups of children in Minnesota, the first with no history of exposure reacted positively in 10 per cent, and the second, children who were living in tuberculous surroundings, reacted positively in 80 per cent. Myers and Magiera reported 41 per cent in a study of 2000 children in Minneapolis. Still, in a group of 58 children with

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no history of tuberculosis and living in the lower East Side of New York City, observed only 9.8 per cent positive Pirquet tuberculin reactions. McLean and Jeidell examined 2000 infants under one year of age and found a positive infection in 7.35 per cent, while in a second group of 512 children of three years of age, it reached 32.5 per cent. Spolverini found 7 per cent positive reactions in a study of 900 infants of the same age, Sander 6 per cent up to two years, and Armstrong 15 per cent for the same period. In New York City Drolet's studies reveal that from 10 to 12 per cent of all children become infected with tubercle bacilli before they reach one year of age. Taking the birth rate of 1923 when 130,000 infants were born, he calculates that in all probability 13,000 of these children become infected during the first year of life.

If we now turn our attention to the study of possible infection in children brought up in a family with a history of tuberculosis, the occurrence of the positive tuberculin reaction is materially increased. Harms and Seitz studying 129 infants under one year of age reported 60 per cent positive tuberculin reactions. Ropke 67.5 per cent and Barchetti 73 per cent. The mortality from tuberculosis in the first year of life after infection has occurred appears to be very high. Brown reports 70 per cent, Hemplemann 78 per cent, Davis 45 per cent, Reuben and Smith 68 per cent, Lemaire 57 per cent, Harms and Seitz 23.9 per cent, Lozano 26 per cent.

From these brief statistics it seems that infants are born with no appreciable resistance to an infection. If they are born into families in which the tubercle bacilli are disseminated continuously, infection will probably take place almost immediately, excessive infection taking place more often from contact with a tuberculous mother than from contact with any other member of the family. In the majority of instances under such conditions a progressive disease is the result, which may often lead to meningitis or miliary tuberculosis; but if the infant comes in contact with only a few organisms and at proper intervals the infant may escape serious consequences.

Under ordinary circumstances, and not in tuberculous surroundings, doubtless children occasionally pick up a few organisms which find their way to the lymph nodes, setting up a small, non-progressive focus which, according to the common belief, is responsible for the relative resistance of the human race. It seems then that in human beings as in animals the most ideal prophylactic immunization will be one established with living organisms which must remain in the body, multiply and cause no disease. Such a type of vaccination is at present very remote.

Prophylactic vaccination against tuberculosis dates back almost to the time of the discovery of the tubercle bacillus. Among the early investigators we may mention Koch, Pasteur, Trudeau, Dixon, Pearson, Gilliland, Maragliano, Th. Smith, Calmette, Römer, Baldwin, Webb and Williams and others.

Among the methods which from time to time have been recommended the following three demand our attention. Vaccination with (1) virulent living, (2) avirulent living and (3) heat-killed virulent tubercle bacilli.

I. VACCINATION WITH LIVING VIRULENT TUBERCLE BACILLI

The widespread infection with tubercle bacilli, when compared with the apparently rare incidence of clinical disease, is so striking that many have advocated living virulent organisms for vaccination. The sponsors of such a method are convinced that only living virulent organisms can establish any degree of protection against a subsequent infection. Webb and Williams, to our knowledge, were the first ones to apply the use of living virulent tubercle bacilli, in an effort to produce immunity in animal and human beings with minute doses. Following some preliminary experiments with guinea pigs and monkeys, using ascending numbers of bacilli (that is, 1, 3, 5, etc.) these authors in 1909 vaccinated five infants all of whom were from tuberculous parents. Such inoculations left no ill effects, the children developed normally, and Webb reported twenty years later that the infants mentioned above developed to manhood and womanhood with no traces of tuberculosis.

Brown, Heise and Petroff in 1914, using guinea pigs, failed to corroborate Webb and Williams' findings. The vaccinated guinea pigs outlived the controls, and all developed chronic tuberculosis.

The most recent investigator to advocate this method is Selter, who, some few years ago, vaccinated a number of infants with living virulent organisms. The lack of further information from this author, leads one to believe that in all probability he has abandoned this method.

The opinion of to-day is that the method is too risky and very likely will never be adopted.

II. VACCINATION WITH HEAT-KILLED TUBERCLE BACILLI

Koch, I believe, was the first to use heat-killed tubercle bacilli in the treatment of and immunization against tuberculosis. Nothing appreciable was done until 1908, when Mantoux and Moussu introduced the intracutaneous test. Römer in 1909 reported the establishment of a hypersensitive state in guinea pigs which had been injected with heat-killed tubercle bacilli. The results, however, were not constant and uniform. These observations were confirmed by Baldwin in 1911. Bessau, after extensive studies, concluded that hypersensitiveness with heat-killed

organisms differed in no way from that established by infection. Petroff and Stewart, Zinsser and Petroff, Branch, Steenken, Jennings and Ward have confirmed the observations of Römer, Baldwin and Bessau. The most recent observations point out that all allergic phenomena can be manifested in animals injected with heat-killed tubercle bacilli, and that the reactions elicited are of the same type and intensity as those observed in infected animals.

Langers cultivated the tubercle bacillus on a special culture media. The young cultures were triturated in salt solution and killed at 100° C. in water bath and this vaccine used to immunize guinea pigs, monkeys and infants. Zadek and Mayer vaccinated infants with Langers' heat-killed organisms. Thirty-four children who came from tuberculous families were vaccinated and observed from one to four years. Every six months physical and x-ray examinations were made. Thirty-three children in this group were free of tuberculosis at the end of four years. Sanger reported similar observations.

III. VACCINATION WITH LIVING AVIRULENT TUBERCLE BACILLI (B.C.G.)

Discussing the supposed acquired immunity established following a mild infection with virulent bacilli, it is pointed out that some students of tuberculosis consider only living virulent organisms as ideal vaccine in tuberculous immunity. At present we cannot consider this type of vaccination as practical since the danger is uncontrollable. We have no assurance that the organism will remain dormant in the body and play the favorable part of a protective mechanism. Very often intercurrent disease modifies and reduces the immunity to such a degree that dissemination of the tubercle bacilli from the apparently benign tubercle may take place. Under such conditions, clinical disease will probably follow. However, if the infection can be set up with an organism of low virulence and efficient antigenic properties, the results will be more desirable. Such were the premises on which Calmette based his method of vaccination.

The organism used by Calmette was isolated by Guérin in 1908 from a calf. It was of bovine origin and moderately virulent for guinea pigs, rabbits and cattle, but after continuous cultivation on glycerinated-potato-bile medium it had lost its power of producing generalized tuberculosis not only in cattle, but also in small laboratory animals. The authors believed that the medium on which the organism was cultivated brought about the change. In an earlier publication Calmette and his coworkers reported that the organism did not form tubercles or set up a tuberculin hypersensitiveness.

When the organism was injected into the cellular tissue of the dewlap of newly born calves, it did not disseminate as in the case of a virulent organism, but remained localized at the site of inoculation for a year. Abscesses aspirated revealed acid-fast rods, which were not capable of infecting guinea pigs on subinoculation.

Subcutaneous inoculations of 3 mg. in guinea pigs and rabbits produced localized lesions in the form of small nodules which disappeared after two to three weeks. When 5 to 10 mg. were inoculated, edema developed on the following day. Within ten to twelve days a small abscess appeared at the point of inoculation, breaking externally and suppurating from two to four weeks and then cicatrizing. The regional lymph nodes became enlarged but not caseous and soon subsided to normal size. Excessive doses from 100 to 150 mg., after two to four weeks, produced small granular follicles in the spleen, which disappeared in the course of two months. When suspected tissues were triturated and inoculated into a second series of animals no progressive disease developed. However, very often when guinea pigs were inoculated with doses of 50 mg. or more, they became emaciated and died. Many tuberculous-like changes were present in the viscera but these authors claimed that the changes were due to pseudotuberculosis, from which bacillus pseudotuberculosis rodentii was isolated.

Administration per os was well tolerated, even in doses up to 100 mg. After two to three weeks following the feeding there was a general glandular enlargement, especially in the mesenteric lymph nodes. If the animals were killed during this period, small follicular lesions were found in the viscera and the tracheobronchial lymph nodes contained many acid-fast bacilli. All these lesions showed no tendency to progress and gradually disappeared.

IMMUNITY IN ANIMALS VACCINATED WITH B.C.G.

Calmette and his co-workers stated that intravenous inoculation of 25 to 30 mg. of B.C.G. in a fine suspension would protect rabbits against .001 mg. bovine bacilli which kills controls in seventy-five days. This resistance diminished in about six months, and the lesions set up by the virulent bovine infection progressed very rapidly, terminating with death. Subcutaneous and intraperitoneal sensitization was not very effective. Rabbits of fifteen to twenty days of age, when vaccinated by the buccal route, resisted subsequent infection of a virulent organism very much like those vaccinated intravenously.

Guinea pigs were not so suitable for immunization for the reason that they are extremely susceptible to intercurrent infection. The adult guinea pig, following a single intracardiac in-

oculation of 5 to 10 mg. or by two subcutaneous inoculations of 50 mg. at two-month intervals, showed considerable resistance to an infecting dose of .001 mg. Or still better, if very young guinea pigs of eight to twenty days of age were given ten feedings of 100 to 150 mg. of the organism with a pipette at twenty-hour intervals, they resisted .001 mg. of a virulent culture. The infecting dose could be given either by intraocular instillation of a drop of fine emulsion, or fed to the young guinea pig. In both instances, according to these authors, the results were very satisfactory.

THE PREPARATION OF THE VACCINE AND THE METHOD APPLIED IN INFANTS

In order to keep the virulence of the organism at a low level, it is cultivated on glycerin-potato-bile medium. When a large quantity is desired, especially in the vaccine preparation, it is advisable to cultivate it on a synthetic medium known as "Sauton's." Surface inoculation is made by floating the seed and an abundant growth accumulates in a short time. Only three weeks' growth is recommended by the author for the preparation of the vaccine. The fluid medium is removed from the flask and sterile glass beads are introduced. The flask is fastened to a shaking machine and after fifteen minutes of vigorous shaking it is diluted with a mixture containing 1 per cent dextrose and 4 per cent glycerol in water. The whole mass is well mixed and allowed to stand until the clumps have settled, the supernatant suspension of living organisms is then diluted so that 1 cubic centimeter represents 5 mg. moist weight of bacilli. Two cubic centimeters of this suspension are mixed with milk and fed to infants. The feedings are made on the third, fifth and seventh days after birth. Each feeding represents approximately 400,000,000 living organisms.

The history of the vaccination of infants with B.C.G. dates from July, 1921, when Turpin and Weill-Hallé fed some infants at the Maternity Hospital in Paris. For the following two years the vaccination was practically neglected. It was not taken up seriously until July 1, 1924. A few years ago Calmette and his coworkers tabulated the results from 52,772 children vaccinated with B.C.G. Six thousand, two hundred and nineteen of the vaccinated were born in tuberculous families, 5,749 of whom had been under observation for one to three and a half years. Of these, 3,808 were vaccinated less than one year, 118 died, making a general mortality of 3.1 per cent and a tuberculous mortality of thirty-four infants or 0.9 per cent. Tuberculous meningitis was given as the cause of death in thirty cases or 88.4 per cent of the tuberculous deaths. The remaining deaths were due to some other form of tuberculosis. Of the eighty-four infants in this group who died from causes other than tuberculosis, twenty-nine or 34.5 per cent, died from gastro-enteritis.

The remaining 1,941 of these 5,749 infants represented a group from one year to three and a half years of age. Twenty-one deaths occurred in this group, or a general mortality of 1.2 per cent; four, or 0.2 per cent, died from tuberculosis.

In a third group of 917 children from two to three and a half years of age, there was no tuberculous mortality.

Perhaps the best controlled study on infant vaccination is that made by Weill-Hallé and Turpin. Their statistics consist of 469 cases vaccinated with B.C.G., ninety-two of whom they lost track and could not include in their study. Another group of sixty was excluded because the duration of time after the vaccination was too short. Of the whole group, they analyzed only 317 cases which were well followed with the intracutaneous skin test. Death occurred in fourteen instances of these 317 infants. Two hundred and thirty-six were from healthy surroundings and sixty-seven from tuberculous environment. The fourteen deaths were equally divided between the two groups, seven in the first and seven in the second.

My interest in B.C.G. began in 1924, and as I had been interested in the problems of immunity to tuberculosis for twenty years, an attempt was made to corroborate, if possible, Calmette's claims. During a period of eight years, six different cultures were studied. The first I obtained from Dr. Watson, the second was brought to me from Paris by Dr. Lawrason Brown, the third I obtained directly from Professor Calmette, and the fourth I brought from Paris in 1928. The fifth came from Dr. W. H. Park and the sixth from Hamburg. The first culture was the most pathogenic and produced tuberculosis in the largest number of guinea pigs. The second and third developed disease only in a few guinea pigs, and the remaining three cultures behaved very much alike, only occasionally developing tuberculosis. From the beginning of our studies we had failed to confirm Calmette's claims.

The discrepancies we attempted to explain on the theory of the dissociation phenomenon which had been our main study for a number of years. This phenomenon may be summarized in a few words: Every strain of tubercle bacillus when cultivated on egg or other media may develop variants which differ not only in the topography of the colonies but have different chemical constituents and virulence, some colonies highly pathogenic and others less for laboratory animals. The development of the pathogenic or non-pathogenic variants depends mainly, we believe, on the environmental conditions. The B.C.G. cultures differed in no way from the other acid-fast bacilli. The colony

which produced tuberculosis we called the "S" colony and that which did not produce tuberculosis we called the "R" colony.

The six cultures of B.C.G. studied at the time were dissociated into "R" and "S" colonies. Some were more prone to dissociate than others. Satisfying ourselves that the organism was not so stable as the sponsors claimed it to be, we attempted to study the immunity established by this organism. Following Calmette's method we failed to observe immunity in guinea pigs greater than that established in similar animals by vaccinating them with heat-killed organisms. Since my earliest publication, confirmatory data have appeared in literature corroborating my observations.

The pathogenicity which I observed in the B.C.G. cultures was attributed by Professors Calmette and Neufeld to contamination for the reason that the "S" variant (the pathogenic form) was virulent only for guinea pigs. Their argument was that if my cultures were offsprings of B.C.G. which was of bovine origin, then it should produce tuberculosis in rabbits. The differentiation of human and bovine bacilli has been studied by many. Rabbits and guinea pigs are good animals to use, and there is no difficulty separating the extreme types, but we often get into difficulties when we are dealing with the intermediate types.

My observations on the instability of various types of tubercle bacilli, the sporadic tuberculosis seen in guinea pigs inoculated with undissociated B.C.G. cultures and the apparently virulent variant "S" dissociated from a number of B.C.G. cultures, led me to the conclusion that the vaccine prepared from this culture was not safe for a wholesale vaccination against tuberculosis. I expressed my opinion before the International Health meeting sponsored by the League of Nations held in Paris, 1928, and in a number of papers published from time to time.

In the meantime, the vaccination was introduced and practiced by many Latin countries in Europe and elsewhere. The results, according to the sponsors, were encouraging and there were no ill effects or fatalities.

The daily press in the spring of 1930 reported the deaths of a number of infants in Lübeck, Germany, following the vaccination with B.C.G. Some 246 babies were vaccinated with B.C.G., seventy-eight of whom died of tuberculosis. In the fall of the same year while in Germany I visited Lübeck. Professor Deycke related to me what had taken place at Lübeck from the time the vaccine had been received until the time of the disaster. The cultures, according to him, were received from the Pasteur Institute in the fall of 1929 and were cultivated in a special room designated for the purpose. At that time no other types of tubercle bacilli were present because of an incubator accident which had destroyed all the cultures. However, several months after the arrival of the B.C.G. culture, an apparently non-virulent type arrived from a Kiel laboratory, and was cultivated in another room. I believe that the error made by him was in cultivating the B.C.G. culture on a media containing human hemoglobin and not on glycerin-potato-bile media.

The death of the vaccinated infants created much indignation in Lübeck and a criminal charge of negligence was instituted against Deycke and others. The trial began on October 12, 1931, and ended on February 7, 1932. During the trial many leading biological scientists were called as expert witnesses on both sides with the result that some important biological fundamentals were brought to light and discussed before the court. Professors Uhlenhuth, Friedberger, Seiffert and others were retained for the defense, and Kolle, Bruno Lange and many others for the prosecution. The principal part of the discussion was the stability of the B.C.G. culture. At times the discussion was very spirited and highly technical. The defense adhered tenaciously to instability, while the prosecution group adhered to stability. However, there was a common ground on which both sides agreed that there was the possibility of contamination with virulent human tubercle bacilli.

Besides Dr. Deycke, there were three other persons involved. Dr. Altstadt, the city health officer, Professor Max Klotz, pediatrician, and Miss Anna Schutze, the laboratory technician. Dr. George Deycke, the director of the laboratory, was sentenced to two years in prison, Dr. Altstadt, fifteen months for homicide and inflicting bodily injury through negligence, while the last two were acquitted.

The court held that the laboratory, although competent to carry on ordinary methods of examination, was unfit for the preparation of B.C.G. vaccines. The court was convinced that the catastrophe was caused by defects in the institution. The responsibility therefore rested entirely on its director, Dr. Deycke, who, as an expert bacteriologist, had failed to recognize the danger of a possible contamination. Furthermore, the court expressed the opinion that if the vaccine had been tested on animals before it was administered to the infants, the catastrophe would have been avoided.

I followed the trial with interest and was surprised when the verdict was announced. My personal belief was then and is now that the verdict was unjust and was based only on inference and not on facts.

The disappointing part was that expert testimony on the fundamental biological evolution had no influence on the court's decision, only the technical error of contamination of the culture was the deciding factor.

The statistical exposition offered by Ludwig Lange, according to my interpretation, spoke against the possibility of contamination. This author divided the infants vaccinated with B.C.G. into four groups, representing times of vaccination. It seemed that all infants were vaccinated from the same original, supposedly contaminated B.C.G. culture, and suspensions prepared at various times and intervals. If we analyze the occurrence of deaths in the four groups, we find that the mortality varied with each group, in some no deaths, while in other groups there were many deaths. It is inconceivable that the laboratory assistant preparing the vaccine should every time have mixed the B.C.G. cultures with the human type of organism. If the cultures were contaminated prior to the vaccination, we would expect that in each subsequent subculture the human tubercle bacillus contaminant would be well represented and when the suspension was prepared the contaminant would be present in approximately the same numbers. If this really did occur, we probably would have had a more uniform death rate for the four groups.

My position at present is that during the trial the prosecution had not a single scientific piece of evidence, or other evidence, to prove that the cultures were contaminated.

Thus ended a chapter in the story of a costly human experiment which, since the death of the originator, is slowly passing into oblivion.

We have stated elsewhere that sociological and educational propaganda has proved very effective in our campaign against tuberculosis, with reference to decreasing the mortality from the disease. However, just because the death rate is declining, I see no reason why we must relax our war against it. By such methods we are building a stronger human race and decreasing the incidence of clinical disease, but what have we done to eliminate widespread infection? Our campaign must concentrate more on the elimination of the etiological factor. This, I believe, can be accomplished by segregation of open cases which act as carriers. The most dangerous are the open cases who apparently feel well, are at large, disseminating the organisms from time to time, and spreading infection. It would seem that every case treated for some ailment other than tuberculosis, and having expectoration, should have the sputum examined for tubercle bacilli, and when found, the patient should be separated from the family and so eliminate the menace to the other members of the family.

In the past I believed allergy to be a desirable factor and implantation of a few organisms beneficial for the human race, but now I am against such a tuberculization and I believe that allergy may be like a two-edged sword, one edge establishing protection and the other, under unfavorable conditions, bringing about clinical disease. Vaccination of some sort may prove beneficial in tuberculous families where isolation or segregation is not possible. Vaccination with living virulent organisms is out of the question as we do not care to pay the price of a possible infection to get a small degree of protection. Living avirulent organisms, when first introduced into the body, may be non-disease-producing, but we have no assurance that once such an organism enters the body it will not become virulent, producing clinical disease. Recent experiments have shown that vaccination with heat-killed tubercle bacilli can establish protection against tuberculosis. Such vaccination is not dangerous because the organisms cannot propagate in the human body.

WHY SURGICAL OPERATIONS BENEFIT PATIENTS WITH PULMONARY TUBERCULOSIS*

BY RICHARD H. OVERHOLT, M.D.†

ADVANCES in thoracic surgery have been so rapid within the past few years that a general appreciation of what benefit may be derived from various operative procedures in this field is naturally desired. A good share of the progress made in this branch of surgery has been in the field of pulmonary tuberculosis. Many stationary cases have been helped back on the road to recovery. Progressive cases have had the destructive process checked and have been afforded a chance for recovery. The number of patients who have been able to leave various sanatoria as apparently arrested cases as a direct result of the use of some form of surgical collapse is steadily increasing.

It is the purpose of this discussion to briefly consider the surgical treatment of pulmonary tuberculosis from the following points of view: 1. The common basis for all surgical collapse procedures. 2. The various methods which are available other than pneumothorax. 3. The differentiation of temporary and permanent forms of collapse. 4. The importance of the selection of the proper form of therapy to be employed either singly or in conjunction with pneumothorax. 5. Lastly, the preliminary presentation of results obtained during the past

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two years in a series of 155 patients who have received some form of pulmonary collapse other than pneumothorax.

All forms of collapse therapy have as a basis two principles. One, a reduction in the size of the involved lung (collapse) and two, a diminution in its motion (rest). A reduction in the movements of the lung that accompany each respiratory act favors the natural process of healing (splints the lung) and lessens the likelihood of a spread of the disease. A reduction in the size of the lung facilitates scar tissue contraction and closure of cavities. The more complete the collapse of that portion of the lung which is involved by the disease, the higher is the percentage of cavity closure. Coincident with the obliteration of the pulmonary cavities, there is a reduction or abolition in the amount of sputum. Coughing is lessened and disappears altogether if the collapse has been adequate. It is also the experience of all collapse therapists that hand in hand with satisfactory obliteration of the diseased areas, in chronic forms of the disease, there is also a simultaneous disappearance of organisms in the sputum.

The question is then raised: Why has the closure of pulmonary cavities become the primary objective in the active treatment of pulmonary tuberculosis? After the diseased process has destroyed a certain proportion of the pulmonary tissue, we have as a result, a thoracic cage which is out of proportion to the size of the remaining healthy lung tissue. If healing takes place through bed rest alone, two things must happen as the scar tissue in the diseased area contracts. First, the remaining lung on that side must expand to occupy the entire hemithorax and, secondly, the boundaries of the hemithorax must move in to decrease the volume of the thoracic cage. Nature is able to bring this about to a certain extent by crowding the ribs closer together, displacing the diaphragm upward, and by shifting the mediastinum toward the affected lobe. In the event that nature is unable to adequately move in the walls which surround the partially destroyed lung, there then results a discrepancy between lung size and thorax size, the actual amount of discrepancy being represented by cavitation. This is where surgery steps in to mechanically help in the process of cavity closure. The permanent collapse procedures move in the walls of the hemithorax so that the size of the chest is reduced to that of the underlying remaining healthy lung. When this has been accomplished and it has been made possible for the lung to fill the entire hemithorax, cavitation ceases to exist.

It is impossible to review the history of the development of the various procedures which are now available. Unmeasurable credit is due to a large number of men in Europe and in this country for leaving us with such a resourceful collapse armamentarium. For a time collapse therapy was limited to those patients with unilateral disease. Emphasis was placed upon the complete collapse of the diseased lobe even at the expense of uninvolved basal portions on the affected side. Recently, greater attention has been focused upon a selective form of collapse, one that will completely close in just the areas of involvement and permit a functioning of healthy portions of the lung on the same side.

Collapse procedures can best be divided into two groups, those which temporarily collapse and rest the lung and those which result in a permanent form of collapse. In a general way, some form of temporary collapse is indicated in, first, all acute or actively progressive forms of the disease and, secondly, in chronic cases where the area of destruction is minimal and re-expansion of the lung is within the realms of probability after healing has occurred. A permanent form of collapse is generally indicated in all chronic forms of the disease where lung destruction has been so great that a difference between lung size and chest size exists, that is, in all cases where the size of the thoracic cage needs to be made smaller and permanently so.

The two temporary forms of collapse are, of course, pneumothorax and the production of a temporary diaphragmatic paralysis by crushing of the phrenic nerve. It is beyond the scope of this discussion to consider the use of pneumothorax therapy; it might be well, however, to present these points of view about its use. In the first place, it is true that in the majority of cases an attempt should be made to induce pneumothorax as the first collapse procedure. Secondly, it is also true that there are many cases who are found to have, when first seen, an extensive involvement with marked fibrosis and cavitation. The lung in such cases will obviously not re-expand after a period of temporary collapse. A great deal of time will be saved for the patient if a consideration be given to a permanent form of collapse without delay. The presence of cavitation admits a failure on the part of nature to make the adjustments so that the lesion can close in by fibrosis. Therefore, a permanent reduction in the size of the thoracic cage is called for. Thirdly, in the event of a partially successful pneumothorax, consideration should be given to the use of some other procedure which will permit a re-expansion of the base of the lung and a more satisfactory collapse of the diseased apex. In other words, pneumothorax is often continued too long with the good lung at the base fully collapsed and the involved lung at the apex only partially collapsed. In the event of a complicating pleuritis or effusion, re-expansion becomes unlikely and basal portions of the lung are sacrificed.

There is a certain proportion of cases in whom the presence of pleural adhesions has in-

terfered with the effectiveness of the temporary collapse of pneumothorax. Such adhesions can often be safely divided with a fine cautery manipulated through a cannula in an interrib space under direct vision of a thoracoscope (closed pneumolysis). The complete division of all adhesions will convert a partial pneumothorax into a complete one. Unfortunately, some adhesions are broad and short, rendering their division by the thoracoscopic instrument hazardous. The operation is not without danger and its use should be limited to those skilled in thoracoscopic work. There is a definite possibility of injury or cauterization of the lung itself with infection of the pleura. There is also the possibility of hemorrhage in a field out of control of the operator. The method has come to be a life-saving procedure, however, for certain selected cases, and is a valuable adjunct to pneumothorax therapy. It must be remembered that such an operation leaves the patients dependent upon artificial pneumothorax which is a temporary or semi-permanent form of treatment. In many instances it is safer to proceed at once with a permanent form of collapse. In table 1 are shown the results obtained in fourteen patients who had pleural adhesions divided by such a method to improve the effectiveness of their pneumothorax.

TABLE 1

RESULTS OF CLOSED PNEUMOLYSIS

Number of patients	14
Sputum converted	1
Symptomatic improvement	8
Clinical improvement	8
X-ray improvement	8
Unimproved	5
Deaths (Tuberculosis Empyema)	1

An interruption of the phrenic nerve results in a cessation of the movements of the hemidiaphragm and causes an elevation of its position. The size of the hemithorax is reduced by one-fourth to one-third depending upon the degree of elevation obtained. By crushing the nerve in the cervical region, a temporary paralysis results which effect lasts six to twelve months or until the nerve fibers grow down to the diaphragmatic muscle from the point of crushing. The temporary paralysis of the phrenic nerve is used as the operation of choice in most instances. The duration of paralysis is sufficient to produce the desired effect on healing in the majority of cases. In the others, the paralysis can be made permanent or some other method of collapse resorted to after the period of temporary phrenic paralysis has elapsed. The operation can be carried out under local anesthesia, without risk and without untoward after-effects. The operation has proved to be a most valuable adjunct to the various collapse procedures at our disposal. A temporary phrenic nerve paralysis is indicated in the following types of subjects:

1. In minimal lesions, predominantly unilateral in preference to pneumothorax.
2. In acute or actively progressive forms of the disease, predominantly unilateral, when pneumothorax fails.
3. In cases with basal involvement.
4. To check pulmonary hemorrhages, pneumothorax failing. This is a very strong indication for a temporary phrenic nerve operation and is often not taken advantage of.
5. As an adjunct to an inadequate pneumothorax when closed pneumolysis seems or has been found to be impossible.
6. To prepare a patient for thoracoplasty, but only when such a patient is not considered a good thoracoplasty risk at the time. It has been found advantageous to preserve diaphragmatic function in all cases who obviously need a permanent form of collapse of the upper lobe. A phrenic paralysis is especially contraindicated in obvious thoracoplasty prospects when the basal portions of the lung are uninvolved.
7. The operation has also been used in some hopeless cases for symptomatic relief, that is, to lessen cough and expectoration.

A preliminary and brief report of results obtained in the phrenic nerve group is shown in table 2. The operations have all been done too recently to make anything more than a general report. The estimation of the benefit derived from the procedure has been divided into three headings.

1. Symptomatic improvement represents the effect on cough, expectoration and the general feeling of the patient. 2. An estimation of the value of the procedure as noted by the attending physician or sanatorium superintendent has been included under clinical effect. 3. The change as noted in the x-ray appearance of the chest at the time of the follow-up. It is interesting to note that over one half of the patients were definitely benefited. Up to the present time, six patients have arrested their disease as the direct result of the aid received by a phrenic nerve operation. This number will increase as time goes on. Some will require additional help before they can be considered as apparently arrested. There is reproduced in figures 1 and 2 the x-ray appearance of the chest of a patient who closed a rather large cavity in the left central lung field within a short time following a phrenic nerve operation.

TABLE 2

RESULTS OF PHRENIC NERVE OPERATION

Total number	93
Follow-up complete	57
Sputum converted to negative	23
Symptomatic improvement	37
Clinical improvement	34
X-ray improvement	28

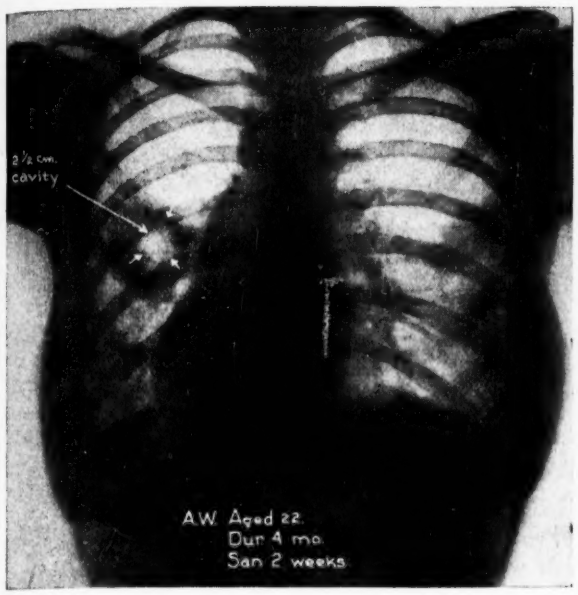

FIGURE 1. Mrs. A. W., aged 22. Referred by Dr. Garnet Smith from the Bristol County Hospital. Preoperative roentgenogram showing cavity in left central lung field with diffuse involvement below the cavity. A left temporary phrenic nerve operation was chosen as the collapse procedure of choice. The operation carries less risk than a pneumothorax. It is the least radical of all of the methods to aid bed rest. It was most improbable that bed rest alone would heal such a lesion. There was no point, therefore, in delaying collapse therapy to see what bed rest alone could do. The added rest and relaxation that a phrenic nerve operation provides were decided upon and carried out two weeks after the patient's admission to the hospital.

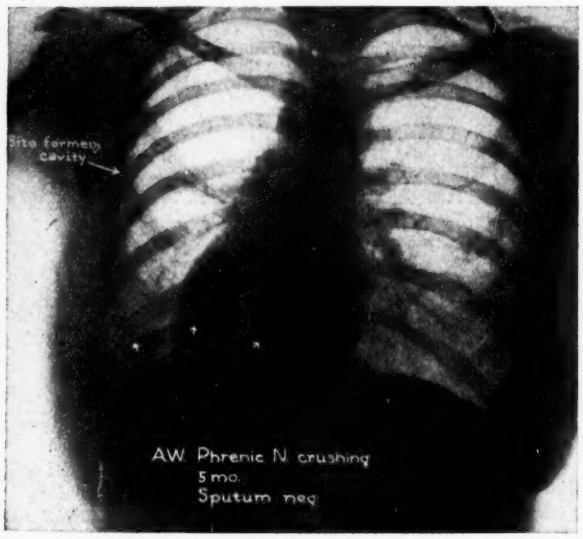

FIGURE 2. Mrs. A. W. Roentgenogram taken five months after left phrenic nerve operation. No cough. No expectoration. Sputum negative. Note elevated diaphragm on right and clear lung field above. The patient was discharged from the sanatorium eleven months after her admission as an apparently arrested case. This could not have been accomplished with bed rest alone.

The production of pulmonary collapse by the removal of a series of ribs, the so-called thoracoplasty operation, has become one of the most effective measures in the treatment of the chronic case. By the removal of a consecutive series of ribs, it is possible to alter the position of the chest wall so that underlying diseased areas will be left in a collapsed state. It is also possible to remove the ribs from the first down so that the maximum collapse is produced where the greatest disease is situated. In order to adequately collapse the apex, it is necessary to remove all of the upper two or three ribs and long segments of the next three or four. In extensive unilateral involvement, it may be necessary to carry out a complete thoracoplasty and remove segments of ribs down to and including the tenth. The operation is frequently divided into two or more stages. The factor of safety is steadily increasing. The operative risk compares favorably with that of major operations carried out in other regions of the body.

The indications for a thoracoplasty may be tabulated in a general way as follows:

1. Cases with unilateral cavitation, fibrotic in character and preferably in the stationary form.
   a. Permanent collapse being required.
   b. Other measures tried and failed.
   c. Other measures not tried but would obviously be inadequate.
2. Complicated pneumothorax cases.
   a. Uncollapsed cavities, permanent reduction in the size of the chest necessary.
   b. Adhesions present, pneumolysis failing or obviously impossible.
   c. The presence of fluid which interferes with the continuance of pneumothorax or the presence of an infected pleura (tuberculous empyema).
3. In cases of bilateral apical involvement.
   a. When the general condition warrants.
   b. When there is sufficient healthy lung at the bases to carry on with a minimal vital capacity of 1500 cc.
   c. When the closure of cavitation on both sides is within the realms of probability.

A follow-up study of all thoracoplasty cases was made on May first. Eighty-one cases had been treated and one hundred and forty-four operations had been performed. The preoperative status of this group of patients is shown in table 3.

The group represents by and large the so-called hopelessly chronic sanatorium invalid. Over half had bilateral disease and of these, fifteen had bilateral cavitation. Patients were not rejected if there was any possibility of helping them whatever. The results have justified the efforts made. In table 4 is shown the status of all cases at the time the group was reviewed. Note that of the living cases none

have been classified as having been made worse by the procedure. There are thirteen who are probably no better but fifty-three have been improved by the operation.

TABLE 3

STATUS OF THORACOPLASTY PATIENTS AT THE TIME OF OPERATION

1.	Average age	30 yrs. (18 to 57 yrs.)		
2.	Average duration of disease	5 years		
3.	Average duration in sanatorium	2.8 years		
4.	Disease moderately advanced	28	Far adv.	53
5.	Disease stationary	55	Progressive	26
6.	Disease unilateral	38	Bilateral	43
7.	Patients with bilateral cavitation	15		
8.	Sputum positive	71	Negative	10
9.	Pneumothorax with fluid	11		
10.	Extrapulmonary tuberculosis complications existing before operation	6		

It was possible to make a more detailed analysis of the first forty-eight thoracoplasty cases. In this group, all stages of the operation had been completed at the time of the follow-up. No cases have been omitted. A fair estimate of what may be accomplished by thoracoplasty is possible. See table 5. The number of operative stages required is indicated. In the majority two operations sufficed. An average of seven ribs was removed. The follow-up chest x-ray showed a satisfactory collapse of the diseased area in forty-six of the forty-eight patients. The sputum was consistently negative in forty-four. It

TABLE 4

PRESENT STATUS OF THORACOPLASTY CASES
(May, 1934)

Number of patients treated	81
Total number of operations	144
Operative deaths	6
Late deaths (in sanatoria)	2
Condition of living cases	
Worse	0
Same	13
Improved	53
Too recent	7

was found that ninety per cent of this group had been benefited by the operation. Of the original group, seventeen had left their respective sanatoria as apparently arrested cases. This number will increase as time goes on since every case must serve a minimum of six months in the hospital after complete disappearance of all evidence of activity.

There are shown in figures 3, 4, and 5, roentgenograms of a patient subjected to a two-stage thoracoplasty. The pre-operative film shows a fibrotic lesion well localized and in an accessible situation for collapsing. A permanent form of collapse was indicated and was carried out

TABLE 5

ANALYSIS OF COMPLETED CASES—48 PATIENTS
(May, 1934)

Number of operations required			I	II	III IV
Patients			16	23	7 2
Average number of ribs resected			7		
Satisfactory x-ray collapse			46		
Sputum positive			4	Negative	44
Worse	0				
Same	4				
Improved	21	90%	Discharged from sanatoria		17
Quiescent	3				
Apparently arrested	20				

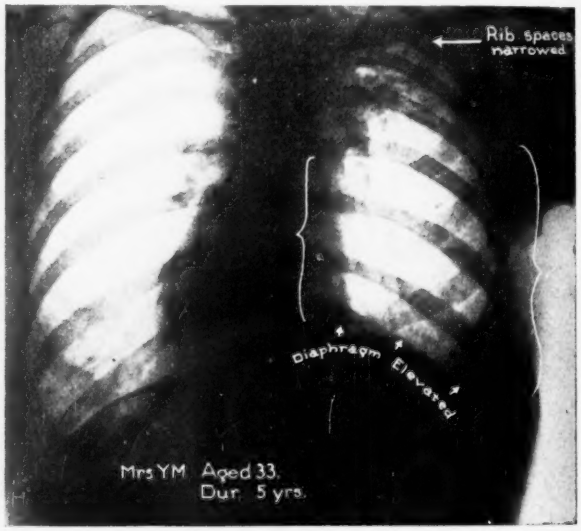

FIGURE 3. Mrs. Y. M., aged 33. Referred by Dr. R. B. Kerr of Manchester, N. H. Duration of symptoms, five years. Sputum positive. Roentgenogram of chest when first seen. Note nature's attempt to heal the right apical lesion. There is extensive fibrosis; the inter-rib spaces are narrowed; the upper mediastinum is displaced to the affected side and the diaphragm is elevated. All of these adjustments have failed. The remaining basal lung could not fill the hemithorax. Some method to reduce the size of the right lung was indicated. Because of the chronicity and extensive fibrosis of the lung, a permanent form of collapse was advised.

without delay. Evidences of activity disappeared, the sputum became negative, and the patient was transferred from a chronic invalid to a comparatively healthy individual.

There is still another type of collapse procedure available as a last resort measure when other methods have failed or are contraindicated. There is a definite but limited usefulness in the extrapleural separation of the dome of the lung and the insertion of a paraffin pack beneath the ribs at that point, the so-called paraffin extrapleural pneumonolysis or "plombage" operation. This procedure can be done under local anesthesia and requires only the limited resection of one rib. The parietal pleura is sepa-

rated by the finger from the under surface of the upper three or four ribs. A specially prepared paraffin mixture is inserted into the newly created space between the undersurface of

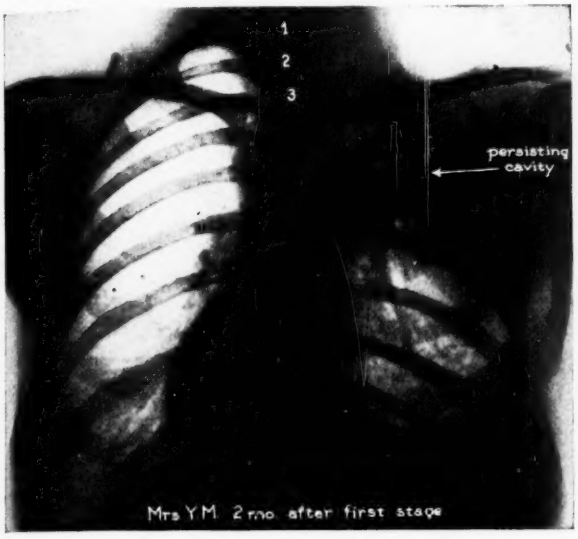

FIGURE 4. Mrs. Y. M. Roentgenogram taken after first-stage thoracoplasty had been performed. The three upper ribs had been removed entirely. The diseased area is shown to be greatly reduced in size, but the collapse of this area is inadequate. Further rib removal was therefore required. Note a lower position of the diaphragm. As the apex of the lung was let down the traction on the diaphragm was released.

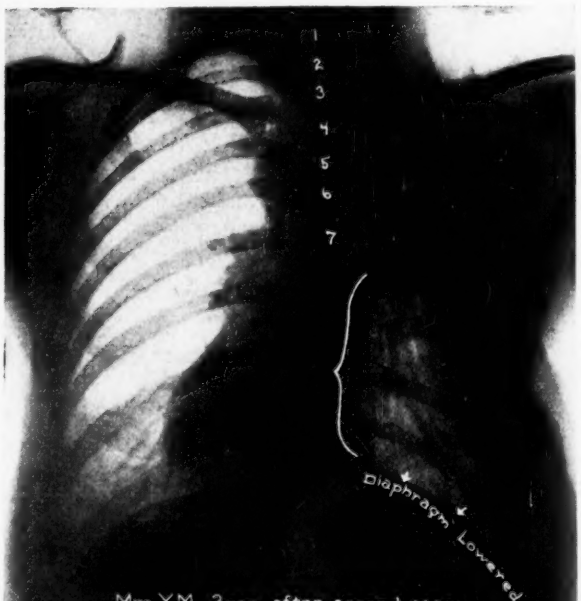

FIGURE 5. Mrs. Y. M. Roentgenogram after second-stage upper thoracoplasty. The diseased area has been completely obliterated. The base of the lung has been conserved. At this time, the patient has no cough, no expectoration and the sputum is negative. She is classified as an apparently arrested case. A selective or limited thoracoplasty proved to be the ideal form of treatment with maximal collapse of the involved lung and the greatest conservation of healthy lung.

the ribs and the parietal pleura of the apex of the lung. The paraffin pack is left in place indefinitely. Often apical cavities can be satisfactorily closed. The operation has the advantage of maintaining the integrity of the thoracic cage, the intact ribs acting as a support to the pack. There is little operative shock. The big disadvantage is, of course, the introduction of a foreign body. Indications for the use of this procedure are principally: one, in bilateral disease which is too extensive to consider a bilateral upper thoracoplasty; two, as a preliminary procedure to thoracoplasty in any case requiring permanent collapse but too sick for a rib resection; three, as an adjunct to other forms of therapy in bilateral disease, that is, pneumothorax or an upper thoracoplasty collapse on the contralateral side. To date, this method has been used in seven patients, all hopeless bilateral cases. All but two have been improved and in these two the progress of the disease was altered but little. The experience to date would seem to justify a continuance of the application of this method of collapse therapy in a few selected cases.

In the choice of the type of collapse therapy to be applied in each given case, the following point should be emphasized. There is a feeling by many who treat cases of pulmonary tuberculosis, that the application of various collapse procedures should always begin with pneumothorax. If that fails, try a phrenic nerve operation and if that fails, and after years of bed rest, consider thoracoplasty. This may prove to be the most expensive way from the standpoint of lung conservation and may cost the patient many months of invalidism. The form of pulmonary collapse that will most certainly and most completely close in the involved areas and at the same time leave the patient with the greatest and best functioning lung, when an arrest of the process has been effected, is the procedure of choice. The method of applying the various procedures in sequence should be discarded. Any one of the methods may be the first that should be tried. The nearer we can come to the proper selection of the type of collapse therapy for each case, the higher will be the percentage of arrested cases.

It should also be emphasized that the surgical treatment of pulmonary tuberculosis does not supplant treatment by bed rest and hygienic measures. It merely is an adjunct to the well-established sanatorium methods. After convalescence from the operation itself, there must be a period of six to twelve months for the fibrous tissue to firmly close in on all areas once affected by the disease.

SUMMARY

1. A discussion has been given regarding the common basis for all collapse procedures in the treatment of pulmonary tuberculosis.

2. The importance of differentiating temporary and permanent forms of collapse has been emphasized.

3. The broad indications for the various collapse procedures have been given.

4. A brief review of the present status of 155 patients treated by collapse therapy other than pneumothorax has been presented.

5. The ideal plan of collapse therapy for any case is the one which will not only check the progress of the disease but will leave the patient with the diseased lung collapsed and all healthy portions of the lung expanded and capable of function.

EDITORIAL NOTE: Another article included in this Symposium will be published in a later issue. The discussion (which applies to the entire Symposium) will appear following the last of the series.

RECENT DEATH

MORAN — BENJAMIN GEORGE MORAN, M.D., a retired physician of 29 Kinsley Street, Nashua, New Hampshire, died at St. Joseph's Hospital, Nashua, September 26, 1934. He was born in Nashua, March 8, 1870, the son of Bernard and Ann (Lee) Moran, and, after graduating from Holy Cross College, studied at the University of Vermont and graduated from the New York University Medical College in 1891.

Dr. Moran was compelled to retire from practice three years ago because of illness.

He was a member of the New Hampshire Medical Society, the Hillsboro County Medical Society, the American College of Surgeons, and during the World War served on the draft board. He served on the Staff of St. Joseph's Hospital for many years, and also served the Memorial and Peterborough Hospitals.

Dr. Moran is survived by his widow and seven children.

THE PROSPECTS OF YOUNG PHYSICIANS

According to the Rosier report, the medical faculties of France attract an ever-increasing number of students. In 1926 these numbered 7,336 and in 1932 they increased to 10,242. Due to its ancient reputation, the medical faculty at Paris is, in particular, invaded.

Professor Roussy, dean of the medical faculty at Paris, attributes this rapid augmentation to the following causes. Young women of French and foreign origin turn more and more toward liberal careers and notably toward medicine. In 1926 the number of women students amounted to approximately 20 per cent of the total enrolment. To-day the women students constitute above 30 per cent of the student body. The majority of women students go in for specialties, while the rest marry and quit the practice of medicine.

Again, foreign students have arrived in increasing numbers since the war, for the most part because of the prestige which follows close in the wake of victory and also because France has become a so-to-speak protectress of the interests of Poland and the Petite Entente. On the other hand, the world economic crisis has forced many students toward a liberal education and this has been a particular plight in Germany. To this must be added the rapid increase of Jewish foreign students, not only those expelled from Germany, who at the University of Paris number only some forty students, but those who, rejected by certain neighborly countries exercising *numerus clausus*, come to France to obtain their doctorate. Most of these return to their own countries after graduation where certain advantages are offered because of their foreign education. These students add greatly to the burden of the French medical schools. Nevertheless, France encourages the advent of these foreign students to her medical faculties. After returning to their respective countries, these medical graduates serve as excellent propaganda for the French medical sciences.

Unfortunately, the quarters for medical instruction are not adequate. Professor Roussy states that the University of Paris medical faculty sends regularly small groups of medical students to the provincial medical schools. In particular, these excessive students are sent to the medical faculty at Lyon, where they are offered modern and adequately equipped quarters for study. This is also the case at Marseilles. But the distribution of medical students is still unequal and this pressing and troublous problem seeks an early and judicious solution.

A reform of medical studies has been demanded both by the professors at the medical faculties and the practicing physicians, as a means of reducing the number of medical students. More rigid examinations have already been enforced since 1932 and the written elementary tests went into effect during the academic year of 1933. The elimination of unfit second-year students will doubtless serve as an excellent check on the rapidly increasing number of medical students. It is generally believed that it is not overdifficult to decide with prudence a second-year student's inaptitude as a future physician.

Professor Roussy strongly advocates a sixth year study consisting mostly of practical work. This practical year will place the student in intimate contact with available clinical material such as he will encounter in his private practice. As matters are arranged at present, only hospital interns and externs are admitted to this essentially practical service. Thus among approximately five thousand medical students at the medical faculty at Paris, there are available only 350 internships and 1,572 externships and these fortunate medical graduates spend from eight to ten years on their medical studies. Among the remaining three thousand students there are numerous foreigners who, after having obtained their medical diplomas, return to their respective countries, without having participated in any practical medical service. As for the French medical graduates, the proposed sixth year reform will permit them to gain a practical knowledge as well as hospital residence. Moreover, this practical year will give them a chance to decide on their aptitude for a given specialty. The aim of this reform is essential to keep abreast with the rapid progress in the medical sciences and to maintain the highest possible prestige for French medicine by turning out adequately trained physicians.—*Med. Rec.*, April 18, 1934.

CASE RECORDS
of the
MASSACHUSETTS GENERAL HOSPITAL

ANTE MORTEM AND POST MORTEM RECORDS AS USED IN WEEKLY CLINICAL-PATHOLOGIC EXERCISES

EDITED BY RICHARD C. CABOT, M.D.

CASE 20411

PRESENTATION OF CASE

An unmarried American nurse thirty years old entered the hospital complaining of chest pain of four months' duration.

The patient was perfectly well until four months before admission when, while on duty, she was suddenly seized with a sharp severe shooting pain located at the apex of the right lung. The pain continued for three hours and then slowly moved to the inferior aspect of the right anterior chest. A few hours later it spread all over the chest. The pain was aggravated by breathing. Strapping the chest, however, gave some relief. She entered a hospital and remained there for approximately one month. In spite of strapping, the pain soon returned to the right apical region. She developed a dry hacking cough. This was especially prominent after laughing or turning over. The cough was never productive. Five days later, after x-ray films were taken by her physician, 350 cc. of fluid was removed from the right chest. The patient stated that the fluid was injected into a guinea pig and was reported as negative. After discharge from this hospital she remained in bed at home until a week before entry, when she again entered the same hospital. A chest tap was done and no fluid withdrawn. During the illness she lost her appetite and strength, and approximately eight pounds in weight. At the time of entry she complained of a localized pain in the right upper quadrant just at the rib margin. The pain radiated straight through to the back.

The family and past histories are non-contributory.

Physical examination showed a well-nourished, rather pale woman lying comfortably in bed. The trachea was in the midline. The chest was symmetrical and expansion was limited on the right. The left chest was negative. The right chest anteriorly showed flatness and decreased to absent breath sounds. Posteriorly the upper two thirds of the right chest showed dullness, decreased breath sounds, whispered voice, increased spoken voice, tactile fremitus, and more posteriorly a few râles, egophony and a friction rub. Examination of the abdomen showed exquisite tenderness at the right costal margin just to the right of the midline. No masses were felt.

The temperature was 99°, the pulse 98. The respirations were 20.

Examination of the urine was negative. The blood showed a red cell count of 4,150,000 with a hemoglobin of 75 per cent. The white cell count was 12,000, with 73 per cent polymorphonuclears. A Hinton test was negative. A tuberculin test 1:1000 was negative.

X-ray examination of the chest showed the entire lower three fourths of the right lung field obscured by homogeneous dullness which displaced the heart and mediastinum slightly to the left. The esophagus was also displaced to a corresponding degree without definite evidence of obstruction or intrinsic deformity. There was no motion in the superior margin of the dull area on the right side. The left diaphragm moved unusually well and the heart and mediastinal shift were not remarkable. The films brought in by the patient showed a large lobulated dense shadow accompanying the anterior lower two thirds of the right lung field. There was also evidence of a small quantity of fluid in the right pleural space. An intravenous pyelogram was negative. A film taken to show the dorsal vertebrae and lower ribs on the right showed no definite variation from the normal.

Chest taps performed in the anterior axillary line and in the nipple line were both dry.

Ten days after entry an exploratory thoracotomy was performed. She did poorly postoperatively. Her temperature ranged between 102° and 103°. The pulse averaged about 120. Her respirations remained between 20 and 25. Her red cell count was down to about 3,000,000, with a hemoglobin of 55 per cent. The white cell count on the eighth postoperative day was 31,000. She gradually failed, her breathing became more difficult and she died approximately three weeks after entry.

X-RAY INTERPRETATION

DR. AUBREY O. HAMPTON: Here is a film taken while the patient was in the hospital and one taken four months earlier. The third has no date. I assume it was the last one taken. The heart was not displaced appreciably at the first examination, but the homogeneous dullness rose to the third rib in front and faded out irregularly above. The left lung was perfectly clear and the heart and mediastinum were in normal position. In this second film we have displacement of the heart toward the left and a hazy border of dullness. The dullness rises toward the mediastinum rather than toward the axillary line. Here the process is increased until almost the entire right lung field is obliterated; the heart is going over the left axillary line.

The lateral view of the chest helps a good deal. Here the upper margin of the dull area is round instead of concave. We can understand why the chest taps were dry.

We interpreted the film of the ribs as ruling out bone metastases or primary bone lesions.

The intravenous pyelogram shows normal kidneys.

Differential Diagnosis

Dr. Walter Bauer: In going over the history the two things that I thought were of most importance were (1) the chief complaint of chest pain of four months' duration—evidently present from onset to exitus—and (2) the description of the first x-ray film as given to us by Dr. Hampton.

I think if one had seen this girl at the very onset all he could probably have said was that we were dealing with a pleurisy that was probably involving the diaphragm. The question is whether it was a primary pleurisy or one secondary to intrapulmonary pathology or to intra-abdominal pathology, such as a subdiaphragmatic abscess or a tumor. The question of abscess below the diaphragm seems unlikely in that there was no history of fever, no history of operation, and nothing much to suggest perinephritic abscess. She did have this dry hacking cough which does not help us in any way. We know that she had irritation without any productive cough. It was of long duration and had been present from the very beginning.

The chest tap helps us in no way as recorded here. It merely tells us that 350 cubic centimeters of fluid was removed. No note is made concerning the color, the specific gravity or the cytology. If the fluid was injected into a guinea pig before it had clotted and was subsequently reported negative, I think that is of considerable significance. Certainly sixty or seventy per cent of patients with tuberculosis would have a positive guinea pig. The history as obtained leads one to believe that the same disease process was responsible for all symptoms from the first entry to the last. They must have observed signs that were consistent with fluid on the second entry, but aspiration at that time was without effect.

I think the most striking thing about the physical examination is the confusion of the physical findings. They might represent the signs of fluid above an area of consolidation; encapsulated fluid with frank consolidation below; consolidation with some areas of atelectasis, or areas of consolidation throughout the lung, some of the consolidated areas being separated from the chest wall by air containing lung tissue. Again, our chest taps were negative. This I personally would interpret as meaning that there probably was no fluid present. If this was a pleural effusion it seems strange that there was no more displacement of the mediastinum and heart unless we were dealing with a chronic infectious process with marked fibrosis and adhesions.

The laboratory data do not help us particularly except for a negative tuberculin test of 1:1000. This coupled with the negative guinea pig from the pleural fluid I think is of some significance. The white cell count of 12,000 with 75 per cent polymorphonuclears does not help us particularly; it could be interpreted as meaning any one of a number of things.

The description of the x-rays and the x-rays as demonstrated to us by Dr. Hampton, I should have interpreted as being more consistent with new growth in the lung than with a pleural effusion, whether primary or secondary to intrapulmonary pathology.

I am inclined to feel that we are probably dealing in this instance with a primary lung tumor and not an encapsulated pleural effusion, or encapsulated empyema. We have pretty good evidence that this process does not originate in the ribs. Special films were taken with that in mind and were negative. We might say that the process in the lung represented a metastasis. I suppose for that reason the pyelogram was done, probably to rule out hypernephroma. One would expect such metastases to be bilateral rather than unilateral. Here again I suppose one would have to consider the question of our old friend lymphoma. I personally should be more inclined to make a diagnosis of primary lung tumor. If I should guess as to what kind of tumor I should say a bronchiogenic carcinoma, more on the law of chances than for any other good reason.

Dr. Tracy B. Mallory: Have you anything to say, Dr. Churchill?

Dr. Edward D. Churchill: I know the answer, so I should not say anything.

Dr. Mallory: Does anyone else care to hazard an opinion?

I think we are ready for you, Dr. Churchill.

Dr. Churchill: This is a very tragic case, because she was but thirty years of age. The only diagnosis we could arrive at preoperatively was tumor of the right thoracic cavity. In dealing with these large tumors of the thoracic cavity we have found that if they lie in the anterior part of the chest they are apt to be dermoids or teratomas. If the tumor lies in the posterior part of the chest it is apt to be a neurofibroma, ganglioneuroma or sarcoma.

As to the physical signs that Dr. Bauer commented upon, in my notes before the operation I interpreted the signs as those of a high fixed diaphragm and fluid, or of tumor in the anterior part of the right chest. The signs I found were diminished breath sounds, friction rub, and normal tactile fremitus and voice sounds in the right chest posteriorly. Anteriorly there was flatness, absent tactile fremitus and distant bronchial breathing.

We operated anteriorly and confirmed the presence of a very large tumor. It looked grossly a good deal like a hypernephroma. Even at the conclusion of the operation we did not know

the true nature of the tumor. It proved to be absolutely inoperable. The tumor was partially separated from the mediastinum and freed from the diaphragm; part of the diaphragm was sectioned anteriorly. I thought that if the tumor did not prove to be too malignant we could operate a second time with a posterior approach. The girl's strength did not hold out and she died on the thirteenth day after operation.

Clinical Diagnoses

Teratoma of the thorax.
Secondary anemia.

Anatomic Diagnoses

Teratoma, arising in the anterior mediastinum.
Operative wound: exploratory thoracotomy.
Hemoperitoneum, slight.
Pulmonary atelectasis, bilateral.
Pulmonary embolism, left.
Pulmonary edema, left.
Thrombi in right adrenal vein and hepatic veins.
Atherosclerosis, aorta.

Pathologic Discussion

Dr. Mallory: At operation Dr. Churchill took a small biopsy of this tumor which was seen by one of the members of the laboratory and called tumor. I saw the frozen section and questioned the diagnosis because I could find only epithelium, fibrous tissue and cartilage. In collapsed, infected lungs the architecture is often so distorted that it is difficult to recognize it as lung tissue. When we got a good section through, however, it was perfectly obvious that it was tumor consisting of cartilage, epithelium and fibrous tissue in an extraordinarily tangled arrangement; in other words we were dealing with a true teratoma which would almost certainly have come from the anterior mediastinum.

At autopsy we were able to prove that that was the case. The tumor lay between the pericardium and the pleura, anterior to the primary bronchus and great vessels. The phrenic nerve, which ordinarily runs down the lateral aspect of the pericardium, was over on the outer aspect of the tumor. The tumor had arisen in the midst of mediastinal tissue and had shifted the phrenic nerve 10 centimeters laterally. The tumor was nearly but not quite encapsulated. It had invaded the diaphragm at one point, but had not penetrated into either the pleural or the pericardial cavity.

An interesting further finding at autopsy, possibly explaining the rapid loss of strength, was extensive thrombosis in various veins, probably dependent on the impairment of the circulation by the large tumor mass. The hepatic veins throughout the liver were filled with thrombi and there was a moderate degree of liver necrosis secondary to that. There also was a thrombus in the inferior vena cava, most marked just at the orifice of the adrenal veins, which had extended into one adrenal vein and the adrenal itself was beginning to undergo necrosis.

There was also a moderate degree of terminal pneumonia.

Dr. Churchill: Although you say that it had not extended into the pleural cavities, one of the chief difficulties encountered in the operation was the adherence of the atelectatic lung. There appeared to be numerous vascular communications between the lung and the tumor, as if a collateral circulation had occurred. It was very difficult to strip the lung off the tumor.

Dr. Mallory: Yes; although I think that could have been an inflammatory adherence rather than tumor growth. We were unable to demonstrate tumor within the lung at any point.

Dr. Hampton: Where did you say the lung was?

Dr. Mallory: It was pushed upward and backward.

CASE 20412

Presentation of Case

A seventeen year old American schoolgirl entered complaining of cough and foul sputum of three weeks' duration.

Three weeks before entry the patient had a tonsillectomy at a hospital. The operation had been performed in the morning and she awoke from the anesthesia at about two o'clock in the afternoon. Between then and five o'clock she had five or six hemorrhages. She returned home on the following day but had remained in bed ever since. She remained on a liquid diet although she had some nausea and a little vomiting. Several days later she experienced an occasional shooting pain in her right chest. A hot water bottle was applied without relief. An ice-bag produced some relief. At four o'clock the following morning, the ninth postoperative day, she awoke with a severe coughing spell and began to raise very foul green sputum. Since the onset of the cough she had felt much worse and had definite fever. The chest pain, however, had disappeared. She raised about a cupful of greenish yellow sputum each day. Occasionally the sputum was brown streaked but never contained any blood.

The family history is non-contributory.

She had had severe attacks of tonsillitis and laryngitis during the previous winter.

Physical examination showed a well-developed and nourished girl coughing frequently and violently and spitting out two or three ounces of rusty foul sputum after coughing. Her teeth were dirty and showed several fillings. There was a grayish exudate in each tonsillar fossa. No tonsillar tissue was seen. The pharynx throughout was moderately injected. There were no enlarged cervical glands. The chest showed slightly diminished expansion on the

right. Over the right lower chest posteriorly the percussion note was dull to flat. Tactile fremitus, breath sounds, whispered and spoken voice were diminished. There were constant fine expiratory râles at the lower border of the right scapula. There were inconstant coarse inspiratory râles in the right midaxillary line, loudest at the fourth and fifth interspaces. Examination of the heart was negative. The abdomen was negative.

The temperature was 102.5°, the pulse 110. The respirations were 30.

Laboratory examination of the urine was negative. Examination of the blood showed a red cell count of 3,600,000 with a hemoglobin of 65 per cent, and a white cell count of 30,000 with 85 per cent polymorphonuclears. Examination of the sputum showed numerous spirochetes.

X-ray examination of the chest showed dullness involving the middle third of the right lung field. The dullness was triangular in shape with its apex at the hilus. Within the dullness there was a large area of diminished density in the lower portion of which was a sharp fluid level. The diaphragm on the right was limited in excursion but in its usual position.

She continued to raise sputum, about three boxes daily. She was put on postural drainage and given neoarsphenamin. Approximately three weeks after admission a first stage operation was performed. The sixth and seventh ribs were freed and the pleura packed away from them by boric strips. The wound was closed tightly. She had a fairly severe postoperative course, requiring an oxygen tent for a few days. Her temperature, pulse and respirations remained elevated.

Two weeks after the first operation a second stage thoracotomy was performed. Empyema was found and drained. Her fever and cough continued and one month later an exploration of the chest wound was performed. No abscess could be identified in the retracted lung through the empyema cavity. Repeated aspirations of the lung gave no lead as to the location of the abscess. The condition of the patient was so poor that more radical surgery was not attempted. She failed rapidly and died, approximately two months after admission.

Differential Diagnosis

Dr. F. Dennette Adams: This is the typical history of a case of lung abscess following tonsillectomy. The first symptom of possible pulmonary complication, pain in the right chest, could have been associated with pleuritis, pneumonitis, or frank pneumonia, but the appearance on the ninth day of cough with foul sputum is practically pathognomonic of lung abscess. Empyema, with rupture into a bronchus, will produce a similar picture but in a case of this kind abscess is much more likely.

The history does not indicate whether this patient had adequate postoperative care. One wonders whether there may not have been some hemorrhage before the patient was well out of the anesthesia and how much inhalation of infected material might have occurred before and during the time the hemorrhages were taking place. Nor does the history indicate whether this girl was operated upon while in poor condition as a result of the severe attack of tonsillitis and laryngitis during the previous winter, or had been treated medically throughout the summer in order to improve her general condition and reduce the operative hazard.

It is my opinion that no patient should be sent home from the hospital on the day following tonsillectomy. Certainly to the medical man it seems poor judgment to send home promptly a patient who has so recently hemorrhaged. It might be permitted under ideal hygienic and home surroundings, granted also constant nursing care, but in this instance—presumably a ward patient and probably with humble home surroundings—it was taking chances.

Physical examination failed to elicit the classic signs of cavity, a not uncommon circumstance—because the inflammatory changes in lungs surrounding the cavity obscure the picture—so that the absence of typical signs does not exclude abscess.

The white cell count of 30,000, with 85 per cent polymorphonuclears, indicates a severe process. The girl was doubtless very ill. The lowered red cell count could hardly be due to the previous bleeding and is probably associated with the severe toxemia; unless, of course, it existed prior to operation because of poor general condition.

One assumes that tubercle bacilli were sought in the sputum and not found.

Postural drainage and general medical care are the bulwark of medical treatment, and in most acute cases of abscess should be given a thorough trial before surgical interference is attempted. Many believe that the arsphenamine compounds are occasionally followed by definite clinical improvement and in many cases make the sputum less foul; others that it is not efficacious.

The first stage operation was done three weeks after admission, doubtless after there seemed to be no expectation of improvement with more conservative treatment. Had she been improving, surgery would probably have been delayed longer. My impression is that she was a very sick girl, that surgery was resorted to not too enthusiastically, and that the outlook was not considered favorable.

She was presumably getting worse on medical treatment, and was therefore operated on early in the hope of staving off further spread of the process. She developed a secondary empyema, either by virtue of rupture of the abscess or more likely direct spread of the infection from

lung to pleura. There were two conditions with which to deal, abscess and complicating empyema, and as the progress record indicates it was a losing proposition.

I am glad to have this case in order to emphasize again to the class my conviction that tonsillectomies should be taken more seriously. There are those who claim that abscess following tonsillectomy is rare—maybe it is in comparison with the number of tonsillectomies done—but the fact remains that there are usually one or two constantly to be found in the medical or surgical wards of any general hospital. These patients should be got into the best possible general condition before operation; not done at a moment's notice, and more attention should be paid to postoperative care. Two or more post-tonsillectomy patients left to recover from anesthesia under one nurse are not receiving proper care and until these facts are recognized and the situation corrected, abscesses will continue to occur. With the best of care, they are not, I suppose, entirely avoidable, but they are certainly too frequent now.

A Physician: Does an abscess occur as often following local anesthesia?

Dr. Adams: There are some who think that a local anesthesia will be followed by as many abscesses as general anesthesia. They think of abscess as an embolic rather than an inhalation process. I have seen it but I believe it is not quite so common. Is that a fair statement, Dr. Mallory?

Dr. Tracy B. Mallory: Yes, my impression is the same, though one sees statistics that point each way.

This girl apparently had her tonsillectomy because she had almost constant tonsillitis for the whole preceding winter and lost about ten pounds in weight. Then in the early part of the summer she regained her weight and was advised to have her tonsils out. The indication for operation was entirely justifiable and the preoperative treatment was apparently good.

Clinical Diagnoses

Abscess of lung.
Bronchopneumonia.

Dr. Adams's Diagnoses

Abscess of lung, post-tonsillectomy.
Secondary empyema.

Anatomic Diagnoses

Pulmonary abscess, right upper lobe.
Encapsulated empyema, right.
Operative wound: drainage of empyema on right.
Bronchopneumonia, left.

Pathologic Discussion

Dr. Mallory: The autopsy showed that the empyema cavity had been adequately drained. They had tried to locate the abscess by exploring with a needle from the empyema cavity. The empyema was low in the chest, lying over the lower lobe, and the abscess, as it turned out, was in the upper lobe. At autopsy no communication between the two could be found although presumably there must have been one at one time. One does not need a big hole to infect the pleural cavity and it might easily close off.

The abscess was quite large, nearly eight centimeters in diameter. Surrounding it there was a diffuse pneumonitis and the same process without abscess formation was present in the lower lobe. In the left lung on the opposite side there was a very fresh bronchopneumonia which was the immediate cause of death. There are various common mechanisms of death in these abscess cases. It is by no means uncommon for them to have a fatal hemoptysis and bleed to death. With the selection of material in this hospital I see more cases of fatal hemoptysis from abscess than from tuberculosis, since tuberculosis is ruled out of the hospital except for certain operative cases.

Extension from abscess to pleural cavity often occurs spontaneously but sometimes it is the result of faulty treatment on the part of doctors caring for the patient. If you have a relatively fresh probable abscess, it is not a good idea to poke around with a needle to find it, possibly pulling out the organisms on the needle and infecting a previously clean pleural cavity. Empyema is undoubtedly sometimes caused by the injudicious use of an exploratory needle. With the immense amount of foul infected secretion that these patients are coughing up through their bronchi, there is always the likelihood that they will suck some of it down into the bronchus of the opposite lung. It is surprising that they do not do it much oftener than they do. The result is a spreading pneumonia on the other side. If we have an abscess in the upper lobe, as this was, we commonly find extension in the form of pneumonitis or bronchiectasis into the lower lobe because pus drains easily downward. It is less common to get it across on the other side because drainage is not so free. If a case goes on long enough, running into a matter of weeks and months, terminal bacterial endocarditis is a fairly common possibility and one is scared that it might develop if a case remains untreated too long. Finally, one real danger of suspended treatment on these cases is embolic metastasis of the infection which four out of five times goes to the brain. Therefore brain abscess is a very common secondary lesion to lung abscess. This route of metastasis also holds for primary cancer of the lung. All brain surgeons are well aware of the frequency with which an apparently primary brain tumor turns out to be metastasis from a cancer of the lung.

A Physician: Do you get pulmonary infarction after tonsillectomy?

Dr. Mallory: Practically never in my experience.

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The Journal does not hold itself responsible for statements made by any contributor.

Communications should be addressed to The New England Journal of Medicine, 8 Fenway, Boston, Mass.

RECENT ADVANCES IN PHYSIOLOGY

DURING a period of three years, the laboratory of physiology at Yale University School of Medicine has published forty-four striking contributions, particularly to the subject of primate physiology. This work, under the direction of Professor John F. Fulton, is not only a tribute to him, but also represents the highest type of physiological investigation. It seems likely that very few, if any, laboratories of equal importance have produced a larger quantity of superior research than has this reorganized School of Medicine at Yale. These papers have been collected into a volume[1], covering a wide field of work. Professor Fulton and his group have been interested primarily in the physiology of the central nervous system, using the higher apes and carrying out their experimental investigations with the latest surgical technique, largely borrowed from the clinical operating theatre. They have been able to add definitely to our knowledge of the functions of the brain. Most important, perhaps, is their work on the premotor cortex, a center not previously thoroughly investigated. In this center one finds the functions of skilled movements, forced grasping, spasticity and vasomotor control grouped together in a relatively small area. Experimental lesions have led to marked disturbance of these functions. In addition, much work has been done upon the autonomic representation in the cerebral cortex, the functions of the frontal lobes, the relation of gastrointestinal disease to the brain, and similar problems. A description of the laboratory and its functions recently appeared in a publication by the Rockefeller Foundation, *Methods and Problems of Medical Education*, 20th series, 1932.

Professor Fulton's researches have not been entirely confined to physiology. He is also a student of bibliography and the history of medicine. His work in this field is illustrated by a second book[2], also published from the same laboratory, containing twenty-six papers of an historical and bibliographical nature. Of most importance in this group are a paper on *Haller and the Humanization of Bibliography*[3], read as the Annual Oration of the Boston Medical Library in 1932, a sympathetic account of the Warrington Academy[4], and finally, a full discussion of the principles of bibliographical citation[5]. The latter paper is designed especially for the use of students, but should find its way into the hands of all editors of medical journals and writers of papers. Other publications include *Selected Readings in the History of Physiology*, 1930, a short account of physiology issued in the Clio Medica Series and *A Bibliography of the Honourable Robert Boyle* (1932), with *Addenda* (1933). This second collection of papers, although not strictly a scientific contribution, is one of great importance, for it adds a humanizing aspect to the more technical research of a physiological nature and gives one an idea of the broadness of Professor Fulton's viewpoint, as well as his unusual erudition.

REFERENCES
1 Section of Primate Physiology, Laboratory of Physiology, Yale University School of Medicine. Collected Papers, July 1, 1930 - June 30, 1934. Vol. 1. New Haven, Conn.
2 Laboratory of Physiology, Yale University School of Medicine, Collected Papers on Bibliography and the History of Medicine, July 1, 1930 - June 30, 1934. Vol. 1. New Haven, Conn.
3 New Eng. J. Med., 206: 323-328, (Feb. 18) 1932.
4 Bull. Inst. Hist. Med., 1: 50-80, (Feb.) 1933. (Supp., Bull. Johns Hopkins Hosp., Vol. 52, No. 2, [Feb.] 1933.)
5 Bull. Med. Libr. Assn., N. S., 22: 183-197, (May) 1934.

THE 1935 ANNUAL MEETING OF THE MASSACHUSETTS MEDICAL SOCIETY

THE report of the Committee of Arrangements for the Annual Meeting of the Council warrants the expectation of one of the most interesting convocations in the history of medicine in this State.

In order to ascertain the wishes of the different sections, the Committee proposes to write

to the Presidents of the several District Medical Societies setting forth the general plans under way for the scientific and social features of the meeting, with the implication that suggestions for additions and modifications of the arrangements will be cordially received.

The Scientific Exhibits will be much larger than formerly and will be under the direction of Dr. Horatio Rogers.

The custom of having the families of the Fellows participate in the social features is to be on a more elaborate scale than formerly. The entertainment of the wives of the Fellows will be arranged by a committee under the Chairmanship of Mrs. William H. Robey, wife of the President of the Society.

The meeting will be held at the Hotel Statler, June 3, 4, and 5. It promises to be a great success from every angle because we have an ambitious and dynamic committee which assures the coöperation of all of the officers.

THE COUNCIL MEETING

On October 3, the Council of the Massachusetts Medical Society met at the Boston Medical Library for the stated meeting.

There was a large attendance, and the business defined in the program as arranged by the Secretary, was conducted with dispatch. The full records of the Transactions will appear in this *Journal* as soon as they have been prepared by the Secretary, Dr. Walter L. Burrage.

The Committee of Arrangements reported that the Annual Meeting of the Society will be held in the Hotel Statler, June 3, 4, and 5, 1935.

After the consideration of the specified subjects on the program, the moderator asked for any incidental business. This gave Dr. George H. Bigelow an opportunity to suggest an expression of opinion respecting the desirability of supporting efforts to secure amendments to the law governing the registration of physicians in Massachusetts. He paid a cordial tribute to the Committee on State and National Legislation for its effective and persistent work before legislative committees, and in the several district societies. Dr. Bigelow felt that the present statute relating to medical registration is far from satisfactory, and that the medical profession should coöperate with the committee in creating more interest in this subject. This matter was discussed by several Councilors, and it was brought out that Massachusetts stands among her sister states as having the lowest requirements for the registration of physicians, for this Commonwealth does not give power to the Board of Registration to determine the standing of medical schools. The result is that any graduate of a chartered medical school which gives a four year course of instruction with a specified number of weeks per year, can be examined by our board, with the result that during this year, two hundred and twelve graduates of medical schools, which are not approved by the Council on Medical Education and Hospitals, have been examined. During this same period, the Board has examined one hundred and thirty-seven graduates of Class A schools. Of the two hundred and twelve coming from the schools unrecognized by the Council, seventy-eight per cent were unable to pass the examinations. Seven non-approved medical schools, and four osteopathic schools were represented in the examinations taken by the two hundred and twelve applicants.

After the general discussion, on motion by Dr. F. J. Cotton as amended by Dr. J. F. Burnham, the Council voted without any dissent in favor of approval of a change in our registration law which will give adequate authority to the Board of Registration in Medicine respecting admission to examination.

Efforts to carry into effect the sentiment of the Council must be through a state-wide educational campaign, for the Legislature has repeatedly refused to enact the bills presented by the Board of Registration. In order to change the attitude of the Legislature it may be necessary to have such an awakened sentiment throughout the State that the opposition to a change in the law can be overcome.

This can be brought about only by the concerted action of those of the medical profession who will devote the time and energy necessary to mould public opinion. The complete record of the Transactions of this meeting merits careful study.

MEETING OF THE AMERICAN COLLEGE OF SURGEONS

The College meets here the week of the fifteenth for its Annual Session and Congress. Nothing remarkable in that, for it happens about every six years for what we like to consider good reasons.

Boston enjoys, probably justly, the reputation of a good city for meetings of this character. Not only have we an old medical tradition, good hospitals, old and new, and high-grade schools, but also a professional spirit that drives us in search of truth and on to the expounding of it. What some of us cherish most is Boston's reputation, medically, for honest exposition of what we have and think. We like to consider that one good reason why the College is here.

The College has come to stand for much that is worth while. This meeting means not only an organized demonstration of all that we have to show our visitors, but it also means that we are a part of an "uplift" program (much as one has come to hate this word). The College is

only now reaching the adult years of twenty-one, but it has long done man's work, and always in the more efficient service by American surgeons. The work done in hospital organization and betterment is well recognized.

The service, through years, of the fracture committee is little known. Originating in Boston, through the efforts of a small group, privately, this has for years been adopted as the National Fracture Committee of the American College. It has been working quietly, studying and popularizing tested methods in this field, getting together the men best experienced and qualified to lead in this matter into a central group of forty, from all over the country, and organizing regional fracture groups to spread their influence and instruction.

The Fracture Course at the Massachusetts General Hospital, an annual feature, given during the week, is a very worth-while demonstration of the Committee's activities.

The coming survey of the ambulance situation in Boston, to make for improvement of a somewhat unorganized important civic function with a survey under the Red Cross, comes directly as an outgrowth of the Committee's work of the last two years. Through another Committee, the College has made a study of problems of industrial surgery with a view to higher standards, and is at work with forward-looking men in other fields, trying to get better service to those injured in industry.

A College Bulletin, lately issued, gives an interesting and very competent survey of present conditions in this field, with suggestions of standards essential to further progress.

That which has been done by the College in furthering cancer study, in sponsoring the work of the Registry of Bone Sarcoma, is an old story.

So it seems clear that this coming meeting is not only a clinical exposition of technical accomplishment, good as that may be, but also a periodic function of a great body of men working for professional advancement and for better service to the communities served.

THIS WEEK'S ISSUE

CONTAINS articles by the following named authors:

RICHARDS, LYMAN G. A.B., M.D. Harvard University Medical School 1919. F.A.C.S. Surgeon in Otolaryngology, Children's Hospital. Associate in Otolaryngology, New England Deaconess and Baptist Hospitals. Consultant in Otolaryngology, Peter Bent Brigham Hospital. Address: 319 Longwood Avenue, Boston, Massachusetts. Associated with him is

WALKER, JOHN. A.B., A.M., M.D. Harvard University Medical School 1930. Formerly: Resident in Surgery, Children's Hospital, Boston, Massachusetts. Present address unknown. Their subject is "Nuts as Bronchial Foreign Bodies." Page 653.

RILEY, AUGUSTUS. A.B., M.D. Harvard University Medical School 1907. F.A.C.S. Assistant Professor in Genito-Urinary Surgery, Harvard Medical School. Visiting Surgeon for Urology, Boston City Hospital. Consultant in Genito-Urinary Department, Boston Dispensary. Consultant in Urology, Malden Hospital. Address: 868 Beacon Street, Boston, Massachusetts. Associated with him is

GASTON, EUGENE A. M.D. Harvard University Medical School 1932. House Officer, Fifth Surgical (Harvard Teaching) Service, Boston City Hospital. Address: Boston City Hospital, Boston, Massachusetts. Their subject is "Incontinence of Urine Due to Ureteral Ectopia." Page 666.

ALPERT, LOUIS. A.B., M.D. Boston University School of Medicine 1929. Assistant Physician at Lakeville State Sanatorium, Middleboro, Massachusetts. His subject is "Report of a Case of Psoas Abscess Resulting from Tuberculosis of the Cervical Spine." Page 675. Address: Lakeville State Sanatorium, Middleboro, Massachusetts.

PETROFF, S. A. Ph.D., Sc.D. Columbia University 1923. Director of Research and Clinical Laboratory, Trudeau Sanatorium, Trudeau, New York. His subject is "Antituberculosis Vaccination." Page 677. Address: Trudeau Sanatorium, Trudeau, New York.

OVERHOLT, RICHARD H. A.B., M.D. University of Nebraska College of Medicine 1926. F.A.C.S. Instructor in Surgery, University of Pennsylvania. Surgeon, Lahey Clinic, Boston, and in charge of Department of Thoracic Surgery. Thoracic Surgical Consultant to New England Deaconess Hospital, New England Baptist Hospital, Norfolk County Hospital, Bristol County Hospital, and New Hampshire State Sanatorium. His subject is "Why Surgical Operations Benefit Patients with Pulmonary Tuberculosis." Page 682. Address: 605 Commonwealth Avenue, Boston, Massachusetts.

MISCELLANY

A BOARD OF TRIAL TO CONSIDER CHARGES AGAINST DR. NICANDRO DE CESARE

Dr. Robey, President of the Massachusetts Medical Society, has appointed five Fellows to act as a Board of Trial to consider charges submitted to him, alleging wilful disobedience of the law by Dr. Nicandro De Cesare in that Dr. De Cesare, the defendant, conspired to defraud a life insurance company by making false statements.

This Board of Trial will convene October 24 at the headquarters of the Society, 8 Fenway, at 12 noon to investigate the charges and act thereon.

The decision to hold this trial was reached only after prolonged investigation by the Committee on Ethics and Discipline, which included a hearing at which the defendant appeared before the Committee. The facts in the case will be presented to the Board of Trial by a member of the Committee on Ethics and Discipline. Fellows of the Society are reminded that it is their privilege to attend the trial and, if they desire, give testimony pertinent to the case.

CORRESPONDENCE

The Massachusetts Medical Society

THE PRESIDENT'S LETTER TO THE FELLOWS

Dear Doctor:

Last winter during a committee meeting, one of the members complained quite bitterly because a greater interest was not taken by our Fellows in the important bills coming before the legislative committees at the State House. Another member who has been active for many years in such matters listened patiently, and finally asked the complainant if he had ever been present at a hearing, and he had to confess "Never," although his office was only a little more than a mile from the State House. It is difficult to induce our Fellows to take the time even to go to a hearing if they do not speak, or to speak if they are present. It is easy to understand that members living at a considerable distance from Boston find it irksome to drop their affairs, to come to the State House and to sit for two or three hours in a committee room; and with a few notable exceptions it is seldom done. Some compare these hearings to a law court of which they have a dread.

When I was secretary of the Committee on State and National Legislation we wished to urge the passage of an important bill devised for the better medical protection of the public, and it was my duty to gather a few proponents whose knowledge of the subject, and whose position in the community classed them as authorities. It was an arduous task. The leading authority in Boston, a professor in a medical school, refused to subject himself to the questions of the legislators. Unlike the cross-examination of a trial it is merely the effort of a group of gentlemen to understand the pros and cons of a bill.

About one-half of our 5000 members live in Boston or its environs and it is easily possible for them to participate in the legislative discussions, but this does not mean a desire on their part to dominate the affairs of the Society, nor does it relieve members living at a distance from responsibility. Fellows who can not attend hearings sometimes have legislators as patients or friends, and it would be comparatively simple to inform them of the status of a bill affecting our profession.

Each District Society should subscribe to the Bulletin of Committee Work and Business of the Legislature which includes the printed text of all bills coming before the session. With this information at hand Fellows may know just what is to be presented before the legislative committees, and then by coöperation and by a recognition of a sense of responsibility, valuable contributions could be made toward the advancement of legislation that might otherwise be delayed or sidetracked.

The Committee on Public Relations has asked the district societies to form local committees which shall coöperate with it in obtaining information on existing hospital accommodations in the state, and all other facilities of which there should be records available. The Committee on Public Relations will issue a questionnaire to doctors, welfare agencies, etc., to assist them in tabulating the data. Later it may be necessary to employ a statistician who will coördinate the information.

The Massachusetts Medical Society is interested in raising the standards of medical education in the State and this problem was actively discussed at the last meeting of the Council. Officers and Fellows of the district societies should give the question serious consideration in preparation for a further discussion of this matter in the near future.

Very truly yours,

WILLIAM H. ROBEY, M.D.

THE SUSPENSION OF DR. FRED H. ALBEE

Managing Editor, *New England Journal of Medicine,*

In your August 9, 1934 *Journal*, page 284, an account has been noted of the suspension of Dr. Fred H. Albee for one year by the Society of the County of New York and also of a civil suit. Reference has been made to a "spirit of jealousy on the part of doctors practicing in another section of Florida".

Dr. Albee is not a member of the Florida Medical Association and no action has been taken by the Florida Medical Association as an organization. However, the editor is of the belief that it is almost the unanimous opinion of the members of the Association that the Society of the County of New York was justified in its action.

Sincerely yours,

SHALER RICHARDSON, M.D.,
Secretary-Treasurer-Editor,
Florida Medical Association, Inc.

OBITUARY

NEW ENGLAND HOSPITAL FOR WOMEN AND CHILDREN

MISS JESSIE E. CATTON

In the recent death of its superintendent, Miss Jessie E. Catton, the New England Hospital for Women and Children has suffered a serious loss, and all her fellow workers a personal grief. She came to us at a crisis, when we were dividing the work once carried by a single officer between two, a superintendent and a resident physician, and we

owe the great success of that change in large measure to her wise and skilful executive guidance.

Miss Catton fulfilled her multiple responsibilities as only a woman of character and resource could have done. To the governing board she gave loyal service; to the medical staff, coöperation; to the patients, sympathy and kindness; to the nurses, a high example; to the public, a dignified courtesy. In all public relations she brought honor to the name of the hospital.

The staff wishes hereby to record its sense of personal loss in Miss Catton's death, and its high appreciation of her service to the hospital.

ALICE H. BIGELOW, M.D.,
Secretary of Staff.

NOTICES

The Massachusetts Medical Society

SECOND ANNUAL POSTGRADUATE MEDICAL EXTENSION COURSE

The following sessions have been arranged by the Committee:

Essex North

Tuesday, October 23, at 4:00 P.M., at the Hotel Bartlett, 95 Main Street, Haverhill. Subject: Surgery. Francis W. Anthony, M.D., Chairman.

Middlesex South

Monday, October 22, at 4:30 P.M., at the Cambridge Hospital, Mt. Auburn Street, Cambridge. Subject: Endocrinology. Charles E. Mongan, M.D., Chairman.

Plymouth

Tuesday, October 23, at 4:00 P.M., at the Brockton Hospital, Brockton. Subject: Cardiovascular Disease. (Second Session on this Subject.) Walter H. Pulsifer, M.D., Chairman.

Additional notices will appear in subsequent issues of the *Journal*.

PETER BENT BRIGHAM HOSPITAL AND CHILDREN'S HOSPITAL

JOINT SURGICAL AND ORTHOPEDIC CLINIC

It has been the custom for many years for the surgical staff of the Brigham Hospital and the surgical and orthopedic staffs of the Children's Hospital to hold an exchange clinic weekly, alternating between the two institutions. Heretofore, this clinic has been held at eight-thirty in the morning, but from now on, with the hope that neighboring physicians might like to attend such a clinic, this visit will be held alternately at the Brigham Hospital and the Children's Hospital Thursday afternoons from four-thirty to five-thirty.

The first clinic will be held at the Brigham Hospital at four-thirty Thursday, October 25, and the next week it will be at the same time at the Children's Hospital, alternating between the institutions for the remainder of the academic year.

As this clinic will immediately follow a medical clinic being given by Professor Christian at the Brigham Hospital, it is hoped that this two-hour period in the teaching amphitheater of the Brigham Hospital one week and the next week divided between the Brigham Hospital and the Children's Hospital may be of value to the local profession and to medical students.

BOSTON HEALTH LEAGUE

43 TREMONT STREET, BOSTON

We feel that we should bring to your notice the first danger signals of cancer because cancer has become such a scourge to the human race.

The danger signals are:

Any lump, especially in the breast.
Any irregular bleeding or discharge.
Any sore that does not heal—particularly about the tongue, mouth or lips.
Persistent indigestion with loss of weight.

Any one of these signs should be brought to the attention of a physician at once.

EDUCATIONAL COMMITTEE ON CANCER.

TUMOR CLINICS IN BOSTON AND BROOKLINE GIVING SPECIAL ATTENTION TO CANCER

Beth Israel Hospital, 330 Brookline Avenue
Tumor Clinic—Tuesday and Thursday, 9:00 A.M.
First Visit 75c; Subsequent Visits 50c.

Boston Dispensary, 25 Bennet Street
Tumor Clinic—Tuesday and Friday, 9:30 A.M.
First Visit 75c; Subsequent Visits 50c.

Collis P. Huntington Memorial Hospital, 695 Huntington Avenue
General Surgical Clinic—Tuesday and Friday, 3:00 P.M.
$2.00 to $5.00 for patients who can afford to pay.

Free Hospital for Women, 80 Glen Road, Brookline
Tumor Clinic—Daily, 8:30 A.M. By appointment only.

Massachusetts General Hospital, Fruit Street
Tumor Clinic—Daily, 8:00 A.M.
First Visit 75c; Subsequent Visits 50c.

Palmer Memorial Hospital, 195 Pilgrim Road
General Diagnostic Tumor Clinic—Monday, 3:00 P.M.
Charge for Examination $1.50. Free to those unable to pay.

Peter Bent Brigham Hospital, 721 Huntington Avenue
Tumor Clinic—Thursday, 1:30 P.M.
First Visit 75c; Subsequent Visits 50c.

A CLINIC FOR THE DIAGNOSIS AND TREATMENT OF TUMORS OF THE MOUTH

A clinic for the diagnosis and treatment of tumors of the mouth has been established at the Beth Israel

Hospital and is carried on in the Out-Patient Department on Thursday mornings at eleven o'clock.

CHARLES F. WILINSKY, M.D., *Director*,
Beth Israel Hospital.

FREE PUBLIC LECTURES IN THE LOWELL INSTITUTE

FOUNDED BY JOHN LOWELL, JR., IN 1836, AND OPENED TO THE PUBLIC IN 1839

Health, Medicine, and Doctors in Colonial Days, as Depicted in the Diary of Elizabeth Drinker, 1758-1807. (Illustrated.) By Cecil K. Drinker, M.D., S.D., Professor of Physiology in and Assistant Dean of the Harvard School of Public Health.

1. A Colonial Family. October 16 (Tuesday).
2. On Keeping Well and Being Ill. October 18 (Thursday).
3. Smallpox and the Fevers. October 23 (Tuesday).
4. The Tuberculosis of William Drinker. October 25 (Thursday).
5. Yellow Fever in Philadelphia. October 30 (Tuesday).
6. Child-Bearing in 1790. November 1 (Thursday).
7. Medical Practice in 1800. November 6 (Tuesday).

To be given in Huntington Hall, 491 Boylston Street, at eight o'clock in the evening. Doors opened at 7:30 o'clock, but closed at 8 o'clock and throughout each lecture.

Tickets may be secured, free of charge, by applying by mail to the curator of the Lowell Institute, 491 Boylston Street, Boston, and enclosing one stamped, addressed envelope for each ticket desired.

Other free lectures in the Lowell Institute are announced in the program, likewise to be had by sending to the curator a stamped, addressed envelope.

MEDICAL LECTURES AT THE CLOVER HILL HOSPITAL

LAWRENCE, MASS.

The annual series of monthly medical lectures will be resumed at the Clover Hill Hospital on Thursday evening, October 18, 1934, at 9 o'clock.

The first lecture of the present series will be:

"Crime and Criminals from Personal Observations and Study," by Abraham Myerson, M.D., Professor of Neurology at Tufts College Medical School.

Physicians of Lawrence and vicinity are cordially invited to attend.

N. F. DE CESARE, M.D., *Chairman.*

NEW PERIODICAL ROOM OPENED AT THE BOSTON MEDICAL LIBRARY

Friends of the Library will be pleased to know that the new periodical room is now available for use, where current medical journals can be conveniently consulted. The management of the Library felt that it was not wise to longer await funds to complete this room in harmony with the beauty and dignity of the adjoining Holmes Hall but have finished the room in a temporary manner which it is hoped will be found adequate. Some 700 medical journals are arranged in compartments around the walls and more commonly used current numbers are to be found spread upon the spacious tables. It is hoped that members will appreciate the opportunity of browsing about in this rich field of current literature.

CLINIC AT THE PETER BENT BRIGHAM HOSPITAL

Dr. Christian's clinic scheduled for 3:30 P.M. on October 18 will be omitted, as the amphitheatre at the Peter Bent Brigham Hospital is being occupied at this time with meetings of the Congress held under the auspices of the American College of Surgeons. The next clinic will be held on October 25 at 3:30 P.M.

NOTICES OF MEETINGS

NEW ENGLAND ROENTGEN RAY SOCIETY

The October meeting of the New England Roentgen Ray Society has been postponed from October 19 to October 26.

RICHARD DRESSER, M.D., *Secretary.*

SUFFOLK DISTRICT MEDICAL SOCIETY

CENSORS' MEETING

The Censors of the Suffolk District Medical Society will meet for the examination of candidates at the Medical Library, 8 Fenway, Thursday, November 1, 1934, at 4:00 o'clock.

Candidates should make personal application to the Secretary, and present their medical diplomas at least one week before the examination.

GEORGE P. REYNOLDS, M.D., *Secretary.*
311 Beacon Street, Boston.

HARVARD MEDICAL SOCIETY

The next meeting of the Harvard Medical Society will be held in the Peter Bent Brigham Hospital Amphitheatre (Van Dyke Street entrance), Tuesday evening, October 23, at 8:15 P.M.

PROGRAM

Presentation of Cases.

Water Losses in Surgical Patients. By Dr. Frederick A. Coller, Professor of Surgery, University of Michigan.

MARSHALL N. FULTON, M.D., *Secretary.*

WILLIAM HARVEY SOCIETY

The next meeting of the William Harvey Society will be held Wednesday, October 17, in the Auditorium of the Beth Israel Hospital, Boston, at 8:00 P.M.

PROGRAM

Speaker: Dr. Emil Novak, University of Maryland Medical School, Baltimore.

Subject: "The Endocrines in Gynecology."

Chairman: Dr. Alonzo K. Paine, Professor of Obstetrics, Tufts College Medical School.

Dr. Novak: A.B., Loyola University; M.D., University of Maryland, 1904; D.Sc. (Hon.) Trinity College, Dublin; Fellow, American Gynecological Society, Southern Surgical Association, American College of Surgeons, Association for Study of Internal Secretions, etc. Former Chairman, Section on Gynecology and Obstetrics, American Medical Associate in Gynecology, Johns Hopkins Medical School. Author: "Menstruation and Its Disorders," and other works. Home: Baltimore.

PLYMOUTH DISTRICT MEDICAL SOCIETY

This meeting will be held October 25, 1934, at the Moore Hospital, 167 Newbury Street, Brockton, Mass.

PROGRAM

"Treatment of Barbiturate Poisoning." Report of a case, Dr. Alfred L. Duncombe, Moore Hospital, Brockton, Mass.

"Gastro-duodenal Hemorrhages from the Roentgenologist's Standpoint." Dr. Max Ritvo, Boston, Mass.; "Gastro-duodenal Hemorrhages from the Surgeon's Standpoint," Dr. G. A. Moore, Brockton, Mass.

G. A. MOORE, M.D., *Secretary.*

WORCESTER NORTH DISTRICT MEDICAL SOCIETY

The quarterly meeting of the Worcester North District Medical Society will be held at the State Colony at East Gardner on Wednesday, October 24, at 4:30 P.M. Dr. Richard M. Smith of Boston will discuss the subject of "Medical Economics." Lunch will be served promptly at 6. Ladies and guests invited.

FRANCIS M. MCMURRAY, M.D., *Secretary.*

ASSOCIATION OF RECORD LIBRARIANS OF NORTH AMERICA

The Sixth Annual Meeting of the Association of Record Librarians of North America will be held at the Hotel Kenmore, Commonwealth Avenue, October 15-19, coincident with the Session of the American College of Surgeons. This association is the only large group of its kind in the world. It is sponsored by the American College of Surgeons, the American Hospital Association and American Medical Association, and was organized here in Boston in 1928. Its work is concerned with the scientific handling of clinical records in hospitals, dispensaries and other medical institutions. Its membership is about 600 at the present time. An attractive program has been planned which will interest not only record librarians but hospital superintendents and medical staffs.

NEW ENGLAND PHYSICAL THERAPY SOCIETY

NOTICE OF POSTPONEMENT OF MEETING

The first fall meeting of the New England Physical Therapy Society has been postponed for one week and will be held at the Evans Memorial, 80 East Concord Street, Boston, on October 24, 1934, at 8 P.M. The program will appear next week.

The change of date was made to permit members to attend the meetings of the American College of Surgeons.

ARTHUR H. RING, M.D., *Secretary.*

CLINICAL CONGRESS OF THE AMERICAN COLLEGE OF SURGEONS

The Committee on Scientific Exhibits has drawn upon the abundant medical resources of Massachusetts to provide a remarkably attractive and instructive exhibit for the benefit of the Fellows. At headquarters and in the medical institutions of Boston there will be presented unusual exhibits on various phases of historical and current events in the practice of surgery and its specialties, dentistry, anatomy, pathology, public health, and anesthesia. An exceptional feature will be an exhibition of works of art by Massachusetts physicians.

At the presidential meeting on Monday evening in Symphony Hall, the president-elect, Dr. Robert B. Greenough, of Boston, will deliver his inaugural address. A feature of this session will be the John B. Murphy oration in surgery by Dr. Donald C. Balfour, of Rochester, Minnesota.

The preliminary program for the Clinical Congress of the American College of Surgeons is substantially as follows:

PRELIMINARY PROGRAM FOR EVENING MEETINGS

PRESIDENTIAL MEETING—MONDAY—OCTOBER 15, 8:15 P.M.

Address of Welcome: Arthur W. Allen, M.D., Boston, Chairman, Committee on Arrangements.

Introduction of Foreign Guests: Franklin H. Martin, M.D., Chicago, Director-General.

Address of Retiring President: William D. Haggard, M.D., Nashville, Tenn.

Inauguration of Officers.

Inaugural Address. Robert B. Greenough, M.D., Boston.

John B. Murphy Oration in Surgery: Principles of Gastric Surgery. Donald C. Balfour, M.D., Rochester, Minn.

TUESDAY—OCTOBER 16, 8:15 P.M.

Living Grafts of Thyroid and Parathyroid Glands. Harvey B. Stone, M.D., Baltimore, with the collaboration of James C. Owings, M.D., and George O. Guy, M.D., Baltimore.

Endocrine Mechanisms in Certain Functional Gynecological Disorders. Emil Novak, M.D., Baltimore.

Fracture Oration: The Unsolved Fracture. Kellogg Speed, M.D., Chicago.

The Giant-Cell Tumor of Bone as a Clinical Entity. Harry Platt, M.S., F.R.C.S., Manchester, England.

WEDNESDAY—OCTOBER 17, 8:15 P.M.

Hydrocephalus and Spina Bifida. Wilder Penfield, M.D., Montreal.

Sterility with Special Reference to Surgical Possibilities. Bethel Solomons, M.D., F.R.C.P.I., Dublin, Ireland.

Diverticulosis and Diverticulitis. Irvin Abell, M.D., Louisville.

THURSDAY—OCTOBER 18, 8:15 P.M.

Symposium on Treatment of Infections:

Infections of Clean Operative Wounds. Frank L. Meleney, M.D., New York.

Infections of the Lip and Face. Frederick A. Coller, M.D., Ann Arbor, Michigan.

Phagedenic Ulcer; Its Recognition and Treatment. Emile Holman, M.D., San Francisco.

The Repairs of Defects Resulting from Full Thickness Loss of Skin from Burns. James B. Brown, M.D., St. Louis.

CONVOCATION—FRIDAY—OCTOBER 19, 8:15 P.M.

Invocation. Rev. Charles Wesley Burns, D.D., LL.D., Boston.

Presentation of Candidates for Fellowship. Franklin H. Martin, M.D., Chicago, Director-General.

Conferring of Fellowships. The President.

Conferring of Honorary Fellowships. The President.

Presidential Address. Robert B. Greenough, M.D., Boston.

Fellowship Address.

On each day of the session there will be clinical exercises, dry clinics, and demonstrations at the Massachusetts General Hospital, Carney Hospital, Boston City Hospital, Children's Hospital, Cambridge City Hospital, Massachusetts Memorial Hospitals, Beth Israel Hospital, Peter Bent Brigham Hospital, St. Elizabeth's Hospital, Palmer Memorial Hospital, New England Deaconess Hospital, New England Hospital for Women and Children, Robert B. Brigham Hospital, Boston Dispensary, Waltham Hospital and the Free Hospital for Women; and on Tuesday and Friday at the Pondville State Cancer Hospital, Tuesday and Thursday at the New England Baptist Hospital, Tuesday and Thursday at the Boston Lying-In Hospital, Wednesday at the Evangeline Booth Maternity Hospital, Thursday at the Massachusetts Women's Hospital, and Wednesday at the Lakeville Sanatorium.

On several separate days, as appears in the program, most of the hospitals in the adjoining towns and cities will be open for inspection, and for the observation of special exercises designed to interest the visiting surgeons.

Full details may be had upon application to Dr. Ernest M. Daland, 483 Beacon Street, Boston.

SOCIETY MEETINGS, CONGRESSES AND CONFERENCES

October 12—Boston Health League. See page 648, issue of October 4.

October 15-19—Sixth Annual Session of the Association of Record Librarians of North America at Hotel Kenmore, Boston. Chairman of Committee on Arrangements—Miss Edith M. Robbins, Peter Bent Brigham Hospital, Boston. See page 700.

October 15-19—American College of Surgeons at Boston. See page 424, issue of August 30, and page 700 of this issue.

October 15-19—Thirteenth Annual Congress of Anesthetists. See page 515, issue of September 13.

October 16—South End Medical Club will meet at the headquarters of the Boston Tuberculosis Association, 554 Columbus Avenue, Boston, at 12 noon.

October 16 - November 6—Free Public Lectures in the Lowell Institute. See page 699.

October 17—William Harvey Society. See page 699.

October 17—Lecture on Learning in Adult Years. See page 646, issue of October 4.

October 18—Medical Lecture at the Clover Hill Hospital. See page 699.

October 19-20—New England Pediatric Society.

Combined meeting of the American Academy of Pediatrics (Region 1), New England Pediatric Society, Philadelphia Pediatric Society, and the New York Academy of Medicine Pediatric Section.

Two sessions on Friday, October 19, at 9:30 A.M. and 2:30 P.M.

One session on Saturday morning, October 20, at 9 A.M.

Dinner Friday evening, October 19, at the Hotel Ambassador.

Headquarters — Hotel Ambassador — Park Avenue and 51st Street, New York City.

GERALD HOEFFEL, M.D., Secretary-Treasurer.

October 22 - November 2—1934 Graduate Fortnight of the New York Academy of Medicine. See page 1240, issue of June 7.

October 23—Harvard Medical Society. See page 699.

October 24—New England Physical Therapy Society. See page 700.

October 25—Peter Bent Brigham Hospital and Children's Hospital Joint Surgical and Orthopedic Clinic. See page 698.

October 26—New England Roentgen Ray Society. See page 699.

October 30-31—Academy of Physical Medicine. The Annual Meeting will be held at the Hotel Pennsylvania, New York, October 30 and 31. For information address Arthur H. Ring, M.D., Secretary-Treasurer, Arlington Heights, Mass.

October 31 - November 2—Massachusetts State Nurses' Association, Hotel Statler, Boston. For information write Miss Helene G. Lee, R.N., 420 Boylston Street, Boston.

November 5-9—Inter-State Postgraduate Medical Association of North America. See page 649, issue of October 4, and page ix, Advertising Section, of this issue.

MASSACHUSETTS DIETETIC ASSOCIATION

November 7—Wednesday, 8 P.M. Forsyth Dental Infirmary for Children, 140 Fenway, Boston, "The Arrest and Control of Dental Caries," Dr. C. L. Drain, College of Dentistry, State University of Iowa.

November 20—Tuesday, 2 P.M. Field Trip: Visit Kitchens of the Hotel Statler.

December 11—Tuesday, 8 P.M. "Food Allergy," Dr. Frank N. Allan, Department of Medicine, Lahey Clinic.

January 8—Tuesday, 8 P.M. "Careers and Natural Abilities," Professor Johnson O'Connor, Human Engineering Laboratory, Stevens Institute of Technology, Hoboken, N. J.

February 12—Tuesday, 8 P.M. "Diabetic Children," Dr. Priscilla White, Joslin Diabetic Unit.

March 12—Tuesday, 8 P.M. "The Effect of Diet on Anemia," Dr. Lewis Diamond, Instructor in Medicine, Harvard University Medical School, Associate Physician, Children's Hospital.

March 19—Tuesday, 2 P.M. Field Trip: Visit Storehouse, First National Stores.

April 9—Tuesday, 8 P.M. "Small Hospital Problems," Miss Margaret Copeland, Superintendent, Free Hospital for Women.

December 3-7—The Radiological Society of North America. See notice on page 562, issue of September 20.

April 29 - May 3, 1935—The American College of Physicians will meet in Philadelphia. For information address Mr. E. R. Loveland, Executive Secretary, 133-135 South 36th Street, Philadelphia, Pa.

June, 1935—Medical Library Association will meet in Rochester, N. Y. For details address the Secretary: Miss Frances N. A. Whitman, Librarian, Harvard University Schools of Medicine and Public Health, Boston, Mass.

DISTRICT MEDICAL SOCIETIES

ESSEX NORTH DISTRICT MEDICAL SOCIETY

October 17—The ninety-third quarterly meeting will be held at Raymonds Sunnyridge Farm, Amesbury Road, Amesbury, on Wednesday, October 17, 1934, at 12:30 P.M. Dr. William F. MacKnight and associates will discuss the interesting adjustments of medical practice to local economic conditions under the Jackson Administration.

The Semi-Annual Meeting will be held in January and the Annual Meeting in May, time, place and subject to be announced.

E. S. BAGNALL, M.D., Secretary.

FRANKLIN DISTRICT MEDICAL SOCIETY

Meetings will be held on the second Tuesday of November, January, March, and May at the Weldon Hotel, Greenfield, Mass.

CHARLES MOLINE, M.D., Secretary.

Sunderland.

MIDDLESEX EAST DISTRICT MEDICAL SOCIETY

November 14—Reading.
January 9, 1935—Melrose.
March 13, 1935—Wakefield.
May 8, 1935—Winchester.

K. L. MACLACHLAN, M.D., Secretary.

1 Bellevue Street, Melrose.

MIDDLESEX SOUTH DISTRICT MEDICAL SOCIETY

October 31—Regular meeting to be held at the Hotel Continental, Cambridge.

ALEXANDER A. LEVI, M.D., Secretary.

PLYMOUTH DISTRICT MEDICAL SOCIETY

October 25—See page 700.

SUFFOLK DISTRICT MEDICAL SOCIETY

October 12—See page 648, issue of October 4.
November 1—Censors' Meeting. See page 699.
November 28—Meeting at the Boston Medical Library. Speakers: Dr. Frederick T. Lord, Dr. Edward D. Churchill, Dr. Roderick Heffron. Subject: Symposium on Pneumonia.
January 23, 1935—General Meeting in association with the Boston Medical Library. Speaker and subject to be announced later.
March 27, 1935—Clinical Meeting at the Boston Lying-In Hospital.
April 24, 1935—Clinical Meeting at the Children's Hospital.

The medical profession is cordially invited to attend all of these meetings.

ROBERT L. DeNORMANDIE, M.D., President.
GEORGE P. REYNOLDS, M.D., Secretary.
HENRY T. HUTCHINS, M.D., Boston Medical Library.

WORCESTER DISTRICT MEDICAL SOCIETY

November 14—Wednesday evening. Grafton State Hospital, North Grafton, Mass. 6:30 P.M.: Buffet supper. 7:30 P.M.: Scientific program and business session. Announcement of subjects and speakers to be presented at a later date. Buffet supper complimentary by the Hospital.
December 12—Wednesday evening. St. Vincent Hospital, Worcester, Mass. 6:30 P.M.: Dinner. 7:30 P.M.: Scientific program and business session. Announcement of subjects and speakers to be presented at a later date. Dinner complimentary by the Hospital.
January 9, 1935—Wednesday evening. Worcester City Hospital, Worcester, Mass. 6:30 P.M.: Buffet supper. 7:30 P.M.: Scientific program and business session. Announcement of subjects and speakers to be presented at a later date. Buffet supper complimentary by the Hospital.
February 13, 1935—Wednesday evening. Worcester State Hospital, Worcester, Mass. 6:30 P.M.: Dinner. 7:30 P.M.: Scientific program and business session. Announcement of subjects and speakers to be presented at a later date. Dinner complimentary by the Hospital.
March 13, 1935—Wednesday evening. The Memorial Hospital, Worcester, Mass. 6:30 P.M.: Buffet supper. 7:30 P.M.: Scientific program and business session. Announcement of subjects and speakers to be presented at a later date. Buffet supper complimentary by the Hospital.
April 10, 1935—Wednesday evening. Worcester Hahnemann Hospital, Worcester, Mass. 6:30 P.M.: Dinner. 7:30 P.M.: Scientific program and business session. Announcement of subjects and speakers to be presented at a later date. Dinner complimentary by the Hospital.
May 8, 1935—Wednesday afternoon and evening. Annual Meeting of the Worcester District Medical Society. The time and place of this meeting will be announced later.

ERWIN C. MILLER, M.D., Secretary,
27 Elm Street, Worcester.

WORCESTER NORTH DISTRICT MEDICAL SOCIETY

October 24—See page 700.

BOOK REVIEWS

Annals of Roentgenology. A series of monographic atlases. Edited by James T. Case. Volume Sixteen. Foreign Body in Air and Food Passages. By Chevalier Jackson and Chevalier L. Jackson. 265 pp. 145 illustrations. New York: Paul B. Hoeber, Inc. $12.00.

This book is volume sixteen of the Annals of Roentgenology edited by Dr. James Case and its general character is much the same as that of previous volumes.

It is elaborately gotten up and like all atlases contains a large number of illustrations with a relatively small amount of printed matter. This volume summarizes the experience of the well-known Jackson Bronchoscopic Clinic. The vast amount of material which they have available has enabled them to collect valuable data and to illustrate it with many interesting and unusual cases. Of particular interest is the chapter discussing the way in which the roentgen examination should be conducted and reported to be of the greatest value to the bronchoscopist and to the patient. This part of the book, at least, should be read by every roentgenologist.

The book is written for the roentgenologist but should also be of value to the bronchoscopist.

Thérapeutique Hydro-Climatologique des Maladies du Rein et des Voies Urinaires. Par A. Lemierre et L. Justin-Besançon. 138 pp. Paris: Masson et Cie, 1934. 20 fr.

This is a short monograph of 138 pages indicating the types of cases with renal disease suitable for hydro-climatic therapy. At the end of the book a list of watering places in France is given. A short paragraph is devoted to the effect of climate on certain renal diseases.

Thérapeutique Hydro-Climatologique de la Tuberculose. Par Leon Bernard et Roger Even. 144 pp. Paris: Masson et Cie, 1934. 20 fr.

A short volume dedicated to the treatment of tuberculosis with the aid of climatic stations, heliotherapy, and watering spas. Indications, the technic of the cure, and the various regions in France suitable for the tuberculous patients are given.